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SYNOPSES OF NORTH-AMERICAN INVERTEBRATES.

XVII. The Rotatoria.

H. S. JENNINGS.

The Rotatoria, or wheel animalcules, consist of minute, chiefly microscopic animals, which are everywhere abundant in fresh water. Along with the Protozoa they constitute by far the largest number of species and individuals among the animals to be found in pools, ponds, rivers, and lakes. A few are found in the ocean, but the rotifers are typically fresh-water organisms.

The most characteristic feature in the organization of the Rotatoria is the ciliated area at (or near) the anterior end of the body, serving as a locomotor organ or to bring food to the mouth. Coupled with the lack of cilia elsewhere on the body, this constitutes a character by which a rotifer may as a rule be recognized at once. This ciliated area is usually known as the corona. It varies excessively in form and structure, and in a few rare aberrant species is lacking.

Male and female differ in form, the males being, as a rule, much smaller than the females, and reduced in structure, — usually lacking the alimentary canal. The males are little known, many species existing in which they have never been observed. Discussions of the structure and classification of the rotifers are therefore based generally on the females alone.

The form of the body is exceedingly varied in the different representatives of the group, — ranging from spherical in Trochosphæra to the excessively attenuated form of *Rotifer neptunius* (Fig. 29) or the spiny, turtle-like form of Polychætus (Fig. 111). As a rule, however, the body is somewhat elongated, and is extended at the posterior end, behind the cloaca, to form a long stalk or a tail-like appendage, called the foot.

This frequently ends in two small points, called the toes. There may or may not be a distinct head, set off from the body by a neck. Dorsal and ventral surfaces are usually (not always) markedly differentiated. In many rotifers (Loricata) the cuticula or outer covering of the body is hardened to form a shell or *lorica;* this may bear elevations, spines, teeth, etc.

The simplest and probably primitive form of the corona is that of a plane disk covered with equal cilia, on the ventral side of the animal at the anterior end, as in Proales. From this the varied forms found have probably been derived, chiefly by the following steps : (1) the outer cilia became longer and stronger, forming a distinct marginal wreath ; (2) the cilia within this wreath were partly or entirely lost ; (3) a second wreath of cilia was developed (or has remained from the original cilia) within or without the above-mentioned wreath. Thus we obtain the condition, which has often been considered the primitive one, of two concentric wreaths, with the mouth between them. This condition is found only in much specialized forms.

In the alimentary canal can be distinguished a mouth, usually situated excentrically in the coronal disk and leading into a muscular pharynx, or *mastax*, which is furnished with chitinous jaws or *trophi;* a narrow œsophagus; a large stomach furnished with a pair of gastric glands, and an intestine leading to the anus. The latter is lacking in some groups. The jaws or trophi are very various in form and furnish a most important systematic character. Certain types of jaws are distinguished ; of these, the more important are the malleate (Fig. 170) and the forcipate (Fig. 171). The other forms (ramate, Fig. 34 ; incudate, Fig. 54 ; uncinate, Fig. 10, etc.) may be related to one of these two types.

Points of especial practical importance for distinguishing species are the following : form, structure, and position of the corona ; presence or absence, form and position, of the foot ; form of the toes ; presence, number, and position of the red eye-spots ; structure of the jaws or trophi ; presence or absence of the intestine and anus ; nature of the cuticula, — whether soft and flexible or hardened to form a shell or lorica ; presence or absence of appendages on the body; and mode of life, — whether fixed or free-swimming.

The Rotatoria are a cosmopolitan group, so that the same species may be, and as a matter of fact frequently are, found in America, Europe, India, China, and Australia. Our rotifer fauna is, on the whole, so far as known, almost identical with that of the one other well-known continent, — Europe. From this it results that the only entirely satisfactory key for America or any other country would be one including all the species of the group. Two hundred and forty species have thus far been recorded from America; it is probable that nearly as many more will be found before the list can be considered to approach completeness. Under these circumstances the following key to known American species can be considered to have merely provisional value. Moreover, the species of many of the larger genera can be determined only from full descriptions and detailed figures; the key should in such cases be used in connection with fuller accounts.

The classification of the Rotatoria is in an unsatisfactory condition. The system employed by Hudson and Gosse in their monograph of the Rotifera is used almost exclusively, and is therefore adopted in essentials in the present key. But it is undoubtedly unsatisfactory in many ways, separating widely many closely related species, and bringing together some that are widely divergent in essential structure. A better classification has been outlined by Wesenberg-Lund, but this has not yet been worked out in sufficient detail to make its use practically satisfactory in such a key.

Owing to the large number of species of the Rotatoria and the frequent difficulty of assigning definite distinguishing characteristics even to the genera, it will be necessary for the key to the genera and species to be purely artificial in character. I give first, therefore, a systematic synopsis of the orders, suborders, and families. This synopsis is based on that given by Hudson and Gosse in the monograph of the Rotifera. I have introduced certain divisions not given by Hudson and Gosse, — such as the general division into Monogononta and Digononta; this division is one which is employed by almost all later authors. Certain families, as the Apsilidæ, Plœsomadæ, Gastropodidæ, and Anapodidæ, are added to those given by Hudson and Gosse; this has become necessary through the progress of investigation since the monograph was written.

Many of the definitions are taken from Hudson and Gosse. The system is based throughout on the structure of the females.

SYNOPSIS OF THE ROTATORIA, WITH CHARACTERS OF THE CLASS, SUBCLASSES, AND ORDERS.

CLASS ROTATORIA OR ROTIFERA (WHEEL ANIMALCULES).

Small microscopic organisms, living chiefly in fresh water, bearing at the anterior end a ciliated area which takes various forms. Body often extended backward to form a stalk or foot. Pharynx with chitinous jaws; cloacal opening, when present, on the dorsal side, at the boundary between body and foot. Excretory organs in the form of fine tubes bearing "flame cells" or "vibratile tags," and opening into a contractile vacuole near the cloaca. Sexes separate; males usually minute, degenerate, lacking the alimentary canal.

SUBCLASS 1, DIGONONTA (HAVING TWO OVARIES).

Order 1. Bdelloida. Swimming with the ciliary wreath and creeping like a leech (or parasitic). Jaws ramate (Fig. 34).
  Family 1. Philodinadæ.
    Genera. Philodina, Rotifer, Callidina, Discopus.
  Family 2. Adinetadæ.
    Genus. Adineta.
Order 2. Seisonacea. Marine; parasitic on Nebalia; no corona. Males not degenerate.
  Family 3. Seisonidæ.
    Genera. Seison, Paraseison, Saccobdella.

SUBCLASS 2, MONOGONONTA (HAVING ONLY ONE OVARY).

Order 4. Rhizota. Fixed forms; foot ending in a disk or cup.
  Family 4. Flosculariadæ.
    Genera. Floscularia, Stephanoceros.
  Family 5. Apsilidæ.
    Genera. Apsilus, (Acyclus), (Atrochus).
  Family 6. Melicertadæ.
    Genera. Melicerta, Octotrocha, Limnias, Limnioides, Cephalosiphon, Œcistes, Pseudœcistes, Lacinularia, Megalotrocha, Conochilus.

Order 5. Ploima. Not fixed; swimming with the ciliary wreath; not creeping like a leech. Jaws never ramate.

Suborder 1. Illoricata. Cuticula flexible, not hardened to form a shell or *lorica*.

Family 7. Microcodontidæ.

Genera. Microcodon, Microcodides.

Family 8. Asplanchnadæ.

Genera. Asplanchna, Asplanchnopus, Ascomorpha, (Hertwigia ?).

Family 9. Synchætadæ.

Genera. Synchæta, (Anarthra), (Polyarthra).

Family 10. Triarthradæ.

Genera. Triarthra, Pedetes, Pteroessa, (Polyarthra and Anarthra).

Family 11. Hydatinadæ.

Genera. Hydatina, Rhinops, Notops, Triphylus, Cyrtonia.

Family 12. Notommatadæ.

Genera. Albertia, Taphrocampa, Pleurotrocha, Notommata, Copeus, Proales, Furcularia, Triophthalmus, Eosphora, Diglena, Distemma, Notostemma, Arthroglena, (Drilophaga) (Monommata ?).

Suborder 2. Loricata. Cuticula stiffened to form a distinct armor or lorica.

Family 13. Rattulidæ.

Genera. Rattulus, Mastigocerca, Elosa, (Cœlopus ?), (Diurella ?), (Borthriocerca ?).

Family 14. Dinocharidæ.

Genera. Dinocharis, Polychætus, Scaridium, (Stephanops).

Family 15. Salpinadæ.

Genera. Salpina, Diplax, Diaschiza, Diplois.

Family 16. Euchlanidæ.

Genera. Euchlanis, Dapidia.

Family 17. Cathypnadæ.

Genera. Cathypna, Distyla, Monostyla.

Family 18. Coluridæ.

Genera. Colurus, Metopidia, Monura, Mytilia, Cochleare, (Stephanops).

Family 19. Pterodinadæ.

Genera. Pterodina, Pompholyx.

Family 20. Brachionidæ.

Genera. Brachionus, Schizocerca, Noteus.

Family 21. Anuræadæ.

Genera. Anuræa, Notholca, Eretmia.

Family 22. Plœsomadæ.

Genus. Plœsoma.

Family 23. Gastropodidæ.

Genera. Gastropus, Hypopus.

Family 24. Anapodidæ.

Genera. Anapus, (Hertwigia).

Order 6. Scirtopoda. Swimming by means of branched appendages resembling in some respects those of the Crustacea. (The ordinal value of this character is decidedly doubtful.)

Family 25. Pedalionadæ.

Genera. Pedalion, Hexarthra.

Of uncertain sytematic position — Trochosphæra, Atrochus, Adactyla, Balatro, Cypridicola.

ARTIFICIAL KEY FOR THE DETERMINATION OF THE GENUS AND SPECIES OF AMERICAN ROTATORIA.

A1. Adult animals attached or united in colonies, usually dwelling in tubes; or if separate and free-swimming, then carrying the transparent tube with them. Foot ending in a flat disk or cup, which is attached to the substratum or to the bottom of the tube (or foot absent in Nos. 15–17) (free-swimming when young) Order RHIZOTA, H. & G.

B1. Not forming colonies; corona with long slender setæ and usually produced into a varying number of lobes bearing the setæ; mouth in the center of the large corona; cilia few, about the mouth, scarcely noticeable. Trophi uncinate (Fig. 10) . . Family FLOSCULARIADÆ

a1. Setæ not arranged in whorls or parallel rows on the lobes of the corona, but scattered or in groups . . . . Floscularia

b1. Free-swimming, carrying the transparent tube

c1. Corona two-lobed; two eyes on the dorsal lobe . 1, *Floscularia mutabilis* Bolton

c2. Corona circular, ciliated, with five short prominences bearing setæ . . . . 2, *F. pelagica* Rousselet (Fig. 1)

b2. Not free-swimming

c1. Corona without distinct lobes, but transversely truncate; setæ short, chiefly on the dorsal and ventral parts of the corona 3, *F. edentata* Collins (Fig. 2)

c2. Lobes of the corona three

d1. Lobes large, separated by deep curved depressions; setæ on the entire rim of the corona . . . . 4, *F. trilobata* Collins (Fig. 3)

d2. Lobes apparently but three — one large dorsal and two small ventral ones; but really with two minute additional lobes between the dorsal and ventral. See *c3*.

c3. Lobes five

d1. A long flexible process on the back of the dorsal lobe; lobes knobbed. . . . . 5, *F. cornuta* Dobie (Fig. 4)

d2. No dorsal process; lobes knobbed

e1. Lobes rather long and slender . . . . 6, *F. coronetta* Cubitt (Fig. 5)

e2 Lobes shorter and thicker . . 7, *F. ornata* Ehr. (Fig. 6) *d3.* Lobes broad, not knobbed, all five well marked; setæ arising both from the summit of the lobes and from the intervening depressions . . . . . 8, *F. campanulata* Dobie (Fig. 7)

d4. The two lateral lobes very small, at first view hardly noticeable; dorsal lobe much larger than ventral

e1. Corona ornamented with dots arranged in symmetrical patterns; animal very small; tube sometimes lacking
9, *F. algicola* Hudson (Fig. 8)

e2. Larger, corona not ornamented as in *e1*
10, *F. ambigua* Hudson

d5. The five lobes forming long slender pointed arms, like those of Stephanoceros (Fig. 9) . . . . . 11, *F. millsii* Kellicott

c4. Lobes seven . . . . 12, *F. regalis* Hudson

a2. Setæ arranged in whorls or oblique parallel rows on the five long pointed lobes of the corona . . . . 13, *Stephanoceros eichhornii* Ehr. (Figs. 9 and 10)

B2. Corona without setæ and apparently without cilia (a minute ciliary wreath can usually be detected on careful search)

a1. Corona with one dorsal lobe, the coronal cup edged with a delicate festooned membrane; body long, with a long slender tapering stalk, by which it is attached. Living in colonies of *Megalotrocha alboflavicans* . . . . 14, *Acyclus inquietus* Leidy (Fig. 11)

a2. Coronal cup a large membranous sack; body short and thick; no foot, — the animal being attached by a flat disk . . . . Apsilus

b1. Coronal cup not oblique, its frontal margin horizontal
15, *A. vorax* Leidy

b2. Coronal cup and its frontal margin oblique; ganglion or brain in the neck

c1. Ventral margin of the coronal cup with a central convex lobe-like projection . . . . . . 16, *A. bipera* Foulke (Fig. 12)

c2. Ventral margin of cup even, without central projecting lobe
17, *A. bucinedax* Forbes (Fig. 13)

B3. Corona without setæ and not produced into long lobes, but with strong conspicuous moving cilia forming a marginal continuous curve about the corona. In this curve there is a more or less conspicuous gap on the dorsal side. Mouth near the ventral side of the corona. On the body just below the corona either a single dorsal antenna, or two ventral ones, or all three, are noticeable. Trophi malleo-ramate (Fig. 16)

a1. Individuals attached, separate, or in branching non-spherical colonies of few specimens (1–30 or thereabouts)

b1. Corona of four lobes (or in No. 21 of three lobes); ventral antennæ obvious; dorsal antenna minute . . . . . Melicerta

c1. Lobes of the corona when expanded wider than the tube; a short, blunt chin on the ventral side below the corona; tube formed of nearly spherical pellets . . . . . 18, *M. ringens* Schrank (Figs. 14, 15, and 16) *c2.* Lobes when expanded of the same width as the tube ; chin long and pointed ; tube of pellets having the form of a pointed cylinder . . . . 19, *M. conifera* Hudson (Fig. 17)

c3. Lobes when expanded more than three times the width of the body ; ventral antennæ very long ; tube gelatinous, without pellets . . . . 20, *M. tubicolaria* Ehr.

c4. Upper (ventral) pair of lobes separated by a large notch ; lower (dorsal) pair almost confluent, so that the corona seems to have but three lobes ; ventral antennæ short ; chin two-pointed. Tube with ovoid fæcal pellets, or floccose, without pellets 21, *M. janus* Hudson (Fig. 18)

b2. Corona broad, of two lobes, with a wide dorsal gap ; dorsal antenna minute ; ventral antennæ obvious ; tube without pellets Limnias

c1. Tube cylindrical, transparent, ringed by transverse ridges at regular intervals ; five horny processes on the dorsal surface of the body, below the corona 22, *L. annulatus* Bailey (Fig. 19)

c2. Tube nearly cylindrical, not ringed, often partly covered with débris ; no horny processes on dorsal surface of the body ; ventral antennæ very short . . . . 23, *L. ceratophylli* Schrank

c3. Tube roughened with transverse rows of raised points ; seven horny processes on the dorsal surface of the body below the corona ; ventral antennæ nearly equal in length to the diameter of the tube . . . . 24, *L. shiawasseensis* Kellicott

b3. Corona nearly circular, with a distinct dorsal gap ; *dorsal antenna very large*, with two projections or hooks at its sides ; ventral antennæ small or absent . . . . Cephalosiphon

c1. Tube tapering to the foot, compact, strengthened with extraneous material ; foot very long and slender . . 25, *C. limnias* Ehr. (Fig. 20)

c2. Tube irregular, semitransparent, gelatinous 26, *C. candidus* Hudson

b4. Corona a wide oval (or nearly circular), indistinctly two-lobed ; dorsal gap minute, ventral antennæ obvious ; dorsal antenna inconspicuous or absent . . . . Œcistes

c1. One or more dorsal hooks or projections below the corona ; ventral antennæ minute ; tube absent or small and irregular

d1. Two dorsal hooks below the corona ; these sometimes branched into antler-like structures . . . 27, *O. melicerta* Ehr. (Fig. 21)

d2. A single dorsal hook below the corona ; foot very long ; animal without a tube, living in the mucilaginous matrix of the alga *Gloiotricha pisum* . . . . . 28, *O. mucicola* Kell.

c2. Antennæ (ventral) very short ; no dorsal hooks

d1. Antennæ set wide apart ; tube very irregular and variable, often beset with extraneous matter . . . 29, *O. crystallinus* Ehr. (Fig. 22) *d2*. Dorsal gap of the corona very wide ; tube opaque, regular, tapering slightly from top to bottom . . 30, *O. intermedius* Davis (Fig. 23)

c3. Antennæ long

d1. Antennæ very long and recurved, tube floccose ; very small 31, *O. longicornis* Davis

d2. Corona large, nearly circular, crossed with thick ribs, tube loose, very irregular, clay colored . 32, *O. umbella* Hudson

a2. Not attached ; inhabiting a tube ; individuals separate or one adult grouped with its young

b1. Corona horseshoe-shaped ; two antennæ on the ventral surface of the body, united almost to their tips 33, *Conochilus dossuarius* Hudson

a3. In clusters of many individuals, forming usually a spherical colony, appearing to the naked eye as a small yellowish or grayish ball

b1. Clusters attached

c1. Body (in known American species) with two or four opaque warts in a transverse row on the ventral side. No tube. Corona broad, kidney-shaped, with short axis dorso-ventral ; antennæ inconspicuous . . . . Megalotrocha

d1. Opaque warts two . . . . 34, *M. semibullata* Hudson (Fig. 24)

d2. Opaque warts four . . . . 35, *M. alboflavicans* Ehr. (Fig. 25)

c2. Dwelling in transparent gelatinous tubes ; body without opaque warts or denticles ; corona heart-shaped with long axis dorso-ventral ; antennæ inconspicuous. 36, *Lacinularia socialis* Ehr.

b2. Free-swimming colonies or clusters . . . . . . Conochilus

c1. Antennæ two, separate except at the base, situated on the corona, between the mouth and the ventral gap ; colonies spherical, of many individuals . . . . 37, *C. volvox* Ehr. (Fig. 26)

c2. Antennæ united, so as to appear single, large and conspicuous, and situated on the corona; clusters usually unsymmetrical and containing comparatively few individuals . . 38, *C. unicornis* Rousselet (Fig. 27)

(*C. dossuarius* — see No. 33)

A2. Not fixed when adult ; not forming colonies nor living in tubes (in a few rare cases the animal lives in a tube, but is never attached by its foot to the bottom of the tube, as in *A1*)

B1. Without *lorica ; i.e.*, the cuticle of the animal is flexible, not stiffened to form an unyielding armor or *lorica*

a1. Swimming with the corona and creeping like a leech ; body usually nearly cylindrical (dorsal and ventral surfaces not being conspicuously differentiated), and composed of rings which may be drawn one within the other in a telescopic fashion. Foot (reckoned from the cloaca to the tip) usually ending in three toes, and bearing two to four spurs some distance from the tip. A dorsal proboscis behind the corona. Trophi or jaws ramate (Fig. 34). (Ovaries two.) Order BDELLOIDA

b1. Corona of two nearly circular retractile lobes, transversely placed Family PHILODINIDÆ
  - *c1.* Eyes two
    - *d1.* Eyes on the frontal column or proboscis . . . . Rotifer
      - *e1.* Constructing and dwelling in tubes 39, *R. mento* Anderson
      - *e2.* Not living in tubes
        - *f1.* Antenna very long (one-half to one-third as long as the body) ; foot short (one-third body length) ; spurs short and thick . . . . 40, *R. macroceros* Gosse (Fig. 28)
        - *f2.* Antenna not remarkably long
          - *g1.* Body very long and slender, white and transparent ; foot extraordinarily long (one and one-half times the length of the rest of the body) ; toes long and slender 41, *R. neptunius* Ehr. (Fig. 29)
          - *g2.* Foot not remarkably long
            - *h1.* Spurs not twice as long as the width of the joint to which they are attached. Body transparent or whitish, not colored or dark.
              - *i1.* Body whitish, opaque, passing gradually into the foot ; spurs one and one-half times as long as the width of the joint to which they are attached, and forming an obtuse angle with each other 42, *R. vulgaris* Schrank (Fig. 30)
              - *i2.* Body thick, suddenly decreasing in size to form the foot, which makes up half the entire length of the animal ; spurs produced to a longish point at the tip 43, *R. macrurus* Schrank
            - *h2.* Spurs at least twice as long as the width of the joint to which they are attached.
              - *i1.* Foot short, distinctly marked off ; toes long, three-jointed ; spurs thrice as long as the width of the joint to which they are attached, and with a constriction one-third of their length from the tip 44, *R. trisecatus* Weber (Fig. 31)
              - *i2.* Body slender ; foot long, not distinctly marked off from the body ; spurs twice as long as the width of the joint to which they are attached, slightly swollen at base 45, *R. elongatus* Weber (Fig. 32)
              - *i3.* Body colored — dark brown, usually covered with débris ; transverse folds very marked ; spurs almost, or quite, three times as long as the width of the joint to which they are attached 46, *R. tardus* Ehr. (Fig. 33)

d2. Eyes in the "neck" — directly over the brain, just above the jaws . . . . Philodina
  e1. Three teeth in each jaw (Fig. 34)
    f1. Body beset with strong spines on the dorsal surface
      47, *P. aculeata* Ehr. (Fig. 34)
    f2. Body without spines, surface usually sticky, so that it is frequently covered with débris ; spurs long and sharp, two and one-half times as long as the width of the joint to which they are attached . . . 48, *P. macrostyla* Ehr.
  e2. Two teeth in each jaw
    f1. Body smooth, colorless, very short, thickened in the middle ; corona very large ; foot sharply set off from the body ; spurs shorter than the width of the joint to which they are attached . . . 49, *P. megalotrocha* (Fig. 35)
    f2. Body colorless or reddish, not short and thick ; foot not distinctly marked off . . . . . . 50, *P. roseola* Ehr.
    f3. Body greenish yellow, otherwise much like the last
      51, *P. citrina* Ehr.
d3. Eyes none . . . . Callidina

(The genus Callidina is a very large and difficult one ; while the following species are all that have been identified in America, doubtless many more will be found.)

  e1. Living in a tube . . . 52, *C. eremita* Bryce (Fig. 36)
  e2. Not living in a tube
    f1. Body with stout, blunt dorsal papillæ, especially on the segment next to the foot
      53, *C. papillosa* Thompson (Fig. 37)
    f2. Body without papillæ or spines
      g1. Foot ending in toes
        h1. Jaws (Fig. 38) small, with numerous (8–10) fine ridges ("teeth")
          i1. Corona as wide as the neck ; ridges ("teeth"), ten in each jaw (Fig. 38) ; spurs drawn to a slender point . . . . . 54, *C. elegans* Ehr. (Fig. 38)
          i2. Corona not so wide as the neck ; ridges or teeth, eight in each jaw (Fig. 39) ; spurs (Fig. 40) short and broad
            55, *C. constricta* Dujardin (Figs. 39 and 40)
        h2. Jaws with but two distinct teeth (in addition to a number of fine ridges)
          i1. Teeth two in each jaw ; spurs at least twice as long as the width of the joint to which they are attached, straight and thick ; body colorless. Parasitic on Aselius 56, *C. socialis* Kellicott (Fig. 41)

i2. Each jaw (Fig. 42) with one large and two small teeth ; spurs (Fig. 43) scarcely as long as the width of the joint to which they are attached, swollen at base ; body yellowish

57, *C. musculosa* Milne (Figs. 42 and 43)

g2. Foot ending in a disk in place of toes ; teeth, six to eight in each jaw ; body reddish . 58, *C. magna* Plate

b2. Corona a flat surface covered with cilia, on the ventral side of the anterior end (Fig. 44) . . . . Adineta

c1. Skin smooth ; no eyes ; proboscis without bristles and with a few cilia ; body broad . . . . 59, *A. vaga* Davis (Fig. 44)

a2. Swimming with the corona ; not creeping like a leech (sometimes creeping with the toes). Jaws of various forms, but never ramate.

A very large number of rotifers fall within this division, and the recognition of species, or in many cases even of genera, is very difficult. In order to reduce the difficulties to a minimum, I separate out a number of species having striking peculiarities, by means of the first five subdivisions given below (*b1–b5*). The following is to be especially noted ; *only the species mentioned under a given characteristic possess that characteristic.* For example, any species having swimming appendages will be found under *b5;* species not named under this subdivision do not have such appendages.

b1. Spherical in form ; no foot ; ciliary wreath midway between the equator and one pole of the sphere

60, *Trochosphæra solstitialis* Thorpe

b2. Foot ending in a *single* pointed "toe"

c1. Corona a circle of strong cilia ; mouth in the center ; form of the body conical ; one eye 61, *Microcodon clavus* Ehr. (Fig. 45)

c2. Corona an oblique ciliated disk, with two auricles ; body brownish red or cherry red in color ; one eye

62, *Notommata monopus* Jennings (Fig. 46)

c3. Corona an oblique ciliated surface with weak cilia ; no eye ; parasitic in fresh-water annelids . 63, *Albertia naidis* Bousfield

b3. Foot ending in two pointed projections, not side by side (as in most rotifers), but one dorsal, the other ventral. Otherwise much like No. 61

64, *Microcodides chlæna* Gosse (*orbiculodiscus* Thorpe)

b4. Corona extended dorsally into a large and broad proboscis, fringed with cilia and bearing near its end two red eyes

65, *Rhinops vitrea* Hudson (Fig. 47)

b5. Body bearing swimming or skipping appendages, in the form of movable spines, blades, or branching crustacean-like limbs ; no foot

c1. Six branching appendages, somewhat like those of a crustacean ; two small stylate appendages on the posterior dorsal surface. Eyes two . . 66, *Pedalion mirum* Hudson (Fig. 48)

c2. Twelve blade-shaped appendages, with serrate edges, arranged in four groups of three each, at about the level of the jaws. One eye . . . . 67, *Polyarthra platyptera* Ehr. (Fig. 49)

c3. Two very long spines (thrice the length of the body), attached ventro-laterally ; eyes two . . . . 68, *Pedetes saltator* Gosse

c4. Three very long spines, two lateral, one ventral. Two eyes 69, *Triarthra longiseta* Ehr. (Fig. 50)

(The remainder of the group (*a2*) are less easily recognizable. It will facilitate the use of the rest of the key to this subdivision to point out in a preliminary way certain striking characteristics of a number of species.)

No eyes. — *Hydatina senta* (No. 87), Albertia (No. 63), Pleurotrocha (No. 91), *Taphrocampa saundersiæ* (?) (No. 92), *Diglena contorta* (No. 93).

Eyes two. — Rhinops (No. 65), Diglena (Nos. 124–129), Distemma (No. 130), *Taphrocampa saundersiæ* (?) (No. 92), Triphylus (No. 85), Pedalion (No. 66), Pedetes (No. 68), Triarthra (No. 69).

Eyes three. — *Asplanchna priodonta* (No. 74), *Asplanchna herrickii* (No. 73), *Triophthalmus dorsualis* (No. 122), Eosphora (No. 123).

Parasitic. — External, — *Pleurotrocha parasitica* (No. 91). Internal, — Albertia (No. 63), Hertwigia (No. 80), *Proales wernecki* (No. 110).

Viviparous (the developing embryo frequently seen within the mother). — Asplanchnopus (No. 70), Asplanchna (Nos. 71–76), *Rhinops vitrea* (No. 65).

No foot. — Trochosphæra (No. 60), Pedalion (No. 66), Polyarthra (No. 67), Pedetes (No. 68), Triarthra (No. 69), Asplanchna (Nos. 71–76), Ascomorpha (Nos. 77–79), Hertwigia (No. 80), Anarthra (No. 81).

b6. No anus, the intestine ending blindly

c1. Foot present (viviparous) . . . . Asplanchnopus

d1. Foot small, on the ventral surface 70, *A. myrmeleo* Ehr. (Fig. 51)

c2. No foot

d1. Large, clear, sac-like animals, with incudate jaws (Fig. 54); corona with two slight conical elevations. Viviparous Asplanchna

e1. Sac-like body with large projections or "humps"

f1. Four humps, — one dorsal, one ventral, and two lateral 71, *A. ebbesbornii* Hudson (Fig. 52)

f2. Three humps, — like the last but with the ventral one lacking (perhaps a variation of 71) . 72, *A. amphora* Hudson

e2. Sac-like body without humps

f1. Eyes three, — one large, on the brain, two small, lateral

g1. A bilobed glandular organ (Fig. 53, *a*) attached close to the opening of the ovary and excretory organs; 20–25 flame cells on each excretory tube
73, *A. herrickii* de Guerne (Fig. 53)

g2. No glandular organ as described in 73; flame cells but 3–5 on each excretory tube 74, *A. priodonta* Gosse

f2. Only one eye

g1. Jaws stout, with doubly pointed ends not serrated (Fig. 54); flame cells 10–20 on each side
75, *A. brightwellii* Gosse

g2. Jaws weaker, ending in a blunt tooth and a broad, thin plate (Fig. 55) (probably a variety of the last)
76, *A. girodi* de Guerne

d2. Very small rotifers, sac-like; corona rising slightly to a single apex; jaws not incudate; not viviparous
Ascomorpha

e1. A single large projecting process at the mid-dorsal edge of the corona

f1. Ovate in form; hyaline except the stomach; on each side of the body a "sub-dorsal groove" . 77, *A. hyalina* Kellicott (Fig. 56)

f2. Flattened; in one view nearly circular, with a neck-like projection; in the edge view oblong, half as long as wide; skin stiffened so as almost to form a lorica
78, *A. orbicularis* Kellicott (?)

(This species is probably founded on dead specimens of *Gastropus stylifer*, No. 153.)

e2. No large projecting process on the corona; dorsal view sac-like; lateral view unsymmetrical, with a gibbous dorsal outline; color usually dark green . . . . 79, *A. ecaudis* Perty (*A. helvetica* Perty; *Sacculus viridis* Gosse) (Fig. 57)

b7. Foot not present; no appendages to body; anus present

c1. Parasitic in Volvox; having a large mid-dorsal projecting process on the corona . . . . 80, *Hertwigia parasita* Ehr.

c2. Not parasitic; body an elongated, parallel-sided, flattened sac; corona squarely transverse, with a single marginal wreath of cilia, and with two broad, flat setæ-bearing prominences on the dorsal side and two long styles near the ventral side . 81, *Anarthra aptera* Hood (Fig. 58)
(See also Trochosphæra, No. 60)

b8. Foot present, ending in two toes placed side by side; body without swimming appendages; anus present

c1. Form a broad, often swollen, cone, of which the foot forms the apex. Corona large, transverse, flat or strongly convex, with four long styles and a number of styligerous prominences ; at the sides of the corona two large ciliated auricles, which may be retracted. A single eye . . . . Synchæta

d1. The slender foot one-third to one-half the length of the remainder of the body ; toes minute . . . . 82, *S. stylata* Wierzejski (Fig. 59)

d2. Foot very short (less than one-sixth the length of the rest of the body)

e1. Body a swollen cone ; corona strongly convex, with two central thick, club-shaped prominences ; auricles very long, usually inclined backward . . . . 83, *S. pectinata* Ehr.

e2. Body a slender cone ; coronal surface almost flat, without club-shaped prominences ; auricles small . 84, *S. tremula* Ehr. (Fig. 60)

c2. Corona large, nearly transverse (slightly oblique), surrounded by a wreath of cilia which is interrupted ventrally, and bearing a number (3–7) of large prominences crowned with styles ; mouth near the ventral side of the corona

d1. Eyes two ; jaws forcipate ; foot slender, of three joints ; stomach with six long cæcal projections . . . 85, *Triphylus lacustris* Ehr. (Fig. 61)

d2. Eyes one or none

e1. Eye one ; body long conical, humped dorsally, its outline with three distinct curves ; corona with three styligerous prominences. Ciliary wreath encircling the corona and a sub-square space at right angles to the corona on the ventral surface . . . . 86, *Cyrtonia tuba* Ehr. (Fig. 62)

e2. No eye ; body long conical ; a large rotifer, 87, *Hydatina senta* Ehr. (Fig. 63)

e3. Body large, sac-shaped, hyaline (like an Asplanchna), foot very small and retractile, situated at the posterior ventral angle of the body, almost on the ventral surface. Jaws malleate ; eye single . . 88, *Notops clavulatus* Ehr. (Fig. 64)

e4. Body strongly arched dorsally ; nearly flat ventrally ; cuticula thickened into a number of definite but inconspicuous folds or teeth (so that the animal might almost be considered loricate) ; foot continuing the body axis, but nearer the ventral side, with two small retractile toes ; one eye 89, *Notops pelagicus* Jennings (Fig. 65)

e5. Body almost square in ventral view ; foot one-third of total length, forming a continuation of the body axis ; one eye . . . . 90, *Notops brachionus* Ehr.

c3. Corona without prominences bearing styles ; consisting of an oblique (or even ventral) disk or area covered with close-set cilia or with numerous interrupted ciliary curves. Two lateral evertible ciliated projections (auricles) present in many species. Jaws forcipate. Soft, flexible, elongated rotifers; exceedingly numerous

(Family NOTOMMATADÆ)

d1. Without eyes . . . . Pleurotrocha

e1. Externally parasitic on fresh-water annelids

91, *P. parasitica* Jennings

e2. Free-swimming, body elongated, fusiform, with numerous marked annulations; head enlarged, with a decurved hood or fleshy proboscis in front; possibly one or two eyes present

92, *Taphrocampa saundersiæ* Gosse (Fig. 66)

e3. Free-swimming; elongated, convex above and gibbous posteriorly, flat ventrally; indications of a neck between head and body; a small hook-like proboscis in front; corona a ventral ciliated area one-third the length of the body; foot very small; toes minute; auricles present; two dorsal antennæ; brain with dark granules at the posterior end

93, *P.* (Diglena) *contorta* Stokes

d2. One eye

e1. Eye in the neck, — that is, attached to the brain, some distance from the front of the head

f1. Body with numerous permanent conspicuous annulations or crenulations; minute larva-like forms; a small projection or "tail" just dorsad of the toes; protrusible auricles present but frequently remaining hidden

Taphrocampa

g1. Body nearly cylindrical, short, thick; brain opaque; two auricles present

h1. Toes short and thick, conical, diverging so as to make an acute angle . . . . . 94, *T. annulosa* Gosse (Fig. 67)

h2. Toes longer, slender and curved; so placed that the two together form the outline of a crescent

95, *T. selenura* Gosse (Fig. 68)

g2. Body elongated fusiform, crenulate; head not enlarged; brain containing a club-shaped granular region; toes short; stout, conical, forming an acute angle with each other . . . 96, *T. clavigera* Stokes

(See also No. 92, *T. saundersiæ*)

f2. Body without numerous permanent conspicuous annulations (though divisible into a number of joints)

(Cuticula somewhat stiffened and with a slight longitudinal dorsal cleft, — see Diaschiza, Nos. 181, 182)

g1. Very large species (.2 to .7 mm. in length), slow moving, usually enlarged behind the middle; brain three (or five) lobed, clear or opaque; corona extending onto the ventral surface as a large movable ciliated "lip" (except in Nos. 99, 100, and 101); body projecting backward over the foot as a jointed or sac-like tail; auricles usually present . . . . Copeus

h1. The two toes alike

i1. Tail slender, usually pointed, prominent, obscurely two-jointed; foot two-jointed

j1. Auricles very long (longer than the width of the head), extending laterally, ciliated only at the tip and along the anterior side . 97, *C. copeus* Ehr. (or *C. ehrenbergii* Gosse) (Fig. 69)

j2. Auricles very small or absent 98, *C. labiatus* Gosse

(97 and 98 are probably identical, 98 being founded on specimens of 97, with the auricles retracted)

i2. Tail thick, rounded, bag-like; auricles large, broadest at base

j1. Brain three-lobed . . . 99, *C. pachyurus* Gosse (Fig. 70)

j2. Brain five-lobed . . 100, *C. quinquelobatus* Stokes

(Probably a variation of 99)

i3. Tail small, inconspicuous; brain three-lobed

j1. Tail a minute tubercle; corona without lip; auricles very small; toes very small 101, *C. cerberus* Gosse (Fig. 71)

h2. The two toes dissimilar in form; tail slender, rounded; no lip 102, *C. americanus* Pell (Fig. 72)

g2. Moderate-sized or small (except No. 106); auricles present; toes small; brain usually partly opaque, not three-lobed; body often projecting behind, above the foot, as a large or small "tail" . . . . Notommata

(A difficult genus with very numerous species, — many of the American ones not yet identified)

h1. Tail long, almost or quite as long as the toes, so that the animal seems to end caudally in three prominent toes . . . 103, *N. tripus* Ehr. (Fig. 73)

h2. Tail inconspicuous or absent

i1. Brain clear; body fusiform; head narrower than the body; auricles small; toes minute cones; foot very short . 104, *N. brachyota* Ehr. (Fig. 74)

i2. Brain more or less opaque

j1. Color orange red or brick red, with a brownish tinge; body long, cylindrical, truncate at each end; cilia extending onto ventral surface almost one-fourth the length of the body; toes very small; a separate foot scarcely distinguishable. Eye near the caudal end of the brain, almost completely hidden by the dense opacity of the latter . . 105, *N. truncata* Jennings (Fig. 75)

j2. Body subcylindrical or sac-like, swollen behind

k1. Very large and slow; body sac-like, with a swollen neck, between which and the body is a constriction; foot short; toes minute 106, *N. collaris* Ehr. (Fig. 76)

k2. Smaller; body subcylindrical; head wide; brain with a spherical opaque mass behind, bearing the eye, and connected by a tube with the front; foot very short, of two joints; toes small, long conical in form. Length, .2 to .3 mm . . . 107, *N. aurita* Ehr. (Fig. 77)

k3. Like *N. aurita*, but smaller and more slender; toes much longer and decurved; the eye sometimes hidden by the opaque brain. Length about .15 mm. . . 108, *N. cyrtopus* Gosse (Fig. 78)

j3. Body cylindrical, long, flexible, with a number of transverse constrictions and longitudinal folds, slightly tapering toward each end; auricles two stalked spheres, with the cilia confined to the spheres; toes very small; brain long, cylindrical, opaque at the caudal end; eye just in front of the opacity . . 109, *N. torulosa* Duj. (Fig. 79)

(*N. vorax* Stokes would be characterized in the same manner; it is probably a synonym of *N. torulosa.*) (See also No. 62, *N. monopus* Jennings)

g3. No auricles, corona a ciliated surface, oblique or extending onto the ventral surface; brain clear; body cylindrical or larviform, usually small Proales

(A large, ill-defined genus, many of its American representatives unidentified or undescribed. The following American species have been reported)

h1. With a small decurved fleshy proboscis at the front

i1. Parasitic in Vaucheria, forming galls; body fusiform; toes small, straight, pointed 110, *P. werneckii* Ehr.

i2. Free-swimming; body cylindrical, slender, fluted longitudinally; proboscis large; eye very large; foot stout; toes slender; pointed . . . 111, *P. felis* Ehr. (Fig. 80) *h2.* No proboscis

i1. Living in gelatinous masses of algæ, or sometimes free in waters full of unicellular algæ. Body nearly cylindrical or oval, slightly arched dorsally; eye large, in two parts, at the anterior border of the brain; foot and toes minute. Adults yellowish brown in color . . . 112, *P. algicola* Kellicott

i2. Body nearly cylindrical, thick, clumsy; head broad, truncate; foot very broad, with a depression in the median line; toes conical 113, *P. sordida* Gosse (Fig. 81)

i3. Body thick, broadest at the head, very flexible and changeable, colorless; toes minute, conical; eye small, inconspicuous . . 114, *P.* (Furcularia) *micropus* Gosse (Fig. 82)

i4. Body slender, soft, larva-like; toes minute; foot indistinguishable . . . . . 115, *P. decipiens* Ehr. (Fig. 83)

i5. Body strongly arched dorsally, flat or convex ventrally; foot conical; toes minute 116, *P. gibba* Ehr. (Fig. 84)

(The animal described under this name by Hudson and Gosse is totally different from Ehrenberg's)

e2. Eye frontal, placed near or at the anterior end of the body. Body nearly cylindrical, somewhat larviform, frequently enlarged in the lumbar region; anterior end conical; corona oblique; the two toes usually rather large and conspicuous Furcularia

f1. Toes unequal, very long and slender 117, *F. longiseta* Ehr.

f2. Toes equal

g1. Toes blade-shaped, acute, decurved, the ventral edge of each notched with two (or sometimes three or more) teeth . . . . . . 118, *F. forficula* Ehr. (Fig. 85)

g2. Toes round and stout at base, and abruptly passing at about a third of their length from the base into a hair-like filament . . . . . . 119, *F. semisetifera* Glascott

g3. Body slender, compressed, the ventral line making a prominent angle; front rounded; face oblique; toes slender, straight, acute . . . . . 120, *F. gracilis* Ehr. (Fig. 86)

g4. Body oblong, slightly compressed, convex on the back, abruptly falling off steeply to the foot; toes stylate, straight, acute, nearly half the length of the body 121, *F. gibba* Ehr. (*Diaschiza semiaperta* Gosse?) (Fig. 87) (*F. micropus*, — see No. 114) *d3.* Three eyes

e1. Eyes in a transverse row near the posterior end of the brain . . . 122, *Triophthalmus dorsualis* Ehr. (Fig. 88)

e2. One large eye on the brain ("cervical"); two smaller ones on the front . . . . Eosphora

f1. Body sac-like, swollen behind, convex dorsally; head separated from the body by a neck, and bearing two prominent auricles; foot slender; toes short, acute 123, *E. aurita* Ehr. (Fig. 89)

d4. Eyes two

e1. Eyes frontal; body usually swelling behind and tapering toward the head; toes usually large; jaws prominent, forcipate . . . . Diglena

f1. A decurved fleshy lobe or hook-like proboscis hanging onto the face from the dorsal margin of the anterior end

g1. Body massive, subcylindrical, dorsum convex, swollen behind; corona a ventral ciliated area; foot a single large joint; toes parallel-sided, abruptly pointed 124, *D. grandis* Gosse (Fig. 90)

g2. Body cylindrical, stout, obtuse at each end, not swollen behind; corona a long ventral area; toes long, curved, somewhat enlarged at base 125, *D. forcipata* Ehr. (Fig. 91)

g3. Eyes colorless; body slender at each end, swollen in the middle; proboscis acute; toes long, slender, curved strongly inward and downward . . 126, *D. circinator* Gosse (Fig. 92)

f2. No proboscis

g1. Body cylindric, long, slender; front broadly truncate (obliquely); foot short, thick; toes long, straight, slender 127, *D. caudata* Ehr. (Fig. 93)

g2. Body short, cylindric, abruptly truncate at each end; toes short, straight, acute, projected from the ventral side, nearly at right angles to the body axis 128, *D. catellina* Ehr. (Fig. 94)

g3. Body oblong, swollen posteriorly; head larger than neck; toes long, slender, straight, perfectly even in thickness, pointed; eyes very close together; jaws protrusile; alimentary canal large, always filled with green matter . . . . . 129, *D. biraphis* Gosse (Fig. 95)

e2. The two eyes cervical in position . . . . Distemma

f1. Body a slender cone; toes stout, recurved, toothed at base . . . . 130, *D. forficula* Ehr.

B2. Cuticula stiffened to form an armor or lorica Suborder LORICATA

a1. Foot absent

b1. Lorica oval, compressed, without teeth or spines, formed of two subequal convex plates ; one eye
131, *Anapus ovalis* Bergendal (Fig. 96)

b2. Lorica truncate in front and behind, formed of a convex dorsal and a concave ventral plate ; no teeth nor spines
132, *Anuræa hypelasma* Gosse (Fig. 97)

b3. Lorica with six teeth or spines at the anterior edge (usually box-like in form, open at the anterior and posterior ends ; frequently with spines at the posterior end also)

  c1. Lorica oblong, convex above, flattened beneath ; dorsal surface marked off into polygonal areas

    d1. Lorica subconical in dorsal view, prolonged at the posterior end into a long, strong spine which is slightly narrowed at its base ; polygonal areas of the dorsal surface divided into right and left sets by a median longitudinal line
    133, *Anuræa cochlearis* Gosse (Fig. 98)

    d2. Lorica as in *d1*, but posterior spine lacking
    Anuræa cochlearis, var. *tecta*

    d3. Like *d1*, but there is a median dorsal row of polygonal areas on the lorica . . . . . *Anuræa cochlearis*, var. *stipitata*

    d4. Lorica subquadrangular, with a spine at each of the two posterior lateral angles 134, *Anuræa aculeata* Ehr. (Fig. 99)

      e1. As in *d4*, but the ridges separating the polygonal areas strongly serrate . . . *Anuræa aculeata*, var. *serrulata*

      e2. As in *d4*, but the two posterior spines unequal
      Anuræa aculeata, var. *valga*

  c2. Dorsal surface of the lorica marked with longitudinal furrows or striations . . . . Notholca

    d1. Lorica a long, narrow, triangular pyramid, prolonged at the posterior end into a long spine, equal in length to the body. Anterior spines large, the right one of the two median spines immensely developed, so as to be as long as the body
    135, *N. longispina* Kellicott (Fig. 100)

    d2. Ovoid, truncated in front, the anterior spines rather short ; body rounded and without spines posteriorly ; longitudinal striations of dorsal plate strongly marked ; dorsal plate of lorica much wider than the ventral plate 136, *N. striata* Ehr.

    d3. Much like *N. striata*, but with a subquadrangular projection from the posterior orifice . . . . . *N. striata*, var. *labis*

    d4. Cylindro-conical in form ; dorsal plate extended posteriorly to form a tooth or spine ; ventral plate elevated posteriorly to form a high angular projection . . . 137, *N. foliacea* Ehr.

a2. Foot present

b1. Foot transversely wrinkled or ringed (as in Figs. 101–102) ; very retractile *c1.* Foot ending in a ciliated cup ; lorica dorso-ventrally flattened, thin ; corona transverse, ciliary wreath two lateral semicircles ; eyes two . . . . Pterodina

  d1. Lorica very flat, circular, edges thin and without teeth or projections . . . . 138, *P. patina* Ehr. (Fig. 101)
  (*P. valvata* is the young of 138)

  d2. Lorica oval in dorsal view, concave on the dorsal side ; edges of the lorica very thick ; no teeth or other projections
  139, *P. reflexa* Gosse (Fig. 102)

  d3. Lorica thin, broadly ovoid or nearly circular, with a prominent tooth on each side at the posterior lateral margin
  140, *P. bidentata* Ternetz

c2. Foot ending in two toes (usually small). Lorica arched dorsally, flat or slightly convex ventrally. Spines or teeth usually (not always) present at the anterior dorsal margin of the lorica (frequently elsewhere also) . . . . Brachionus

  d1. Lorica with *six* teeth or spines at the anterior margin of the dorsal plate (with or without posterior spines)

    e1. The two middle anterior spines longest and curving outward ; ventro-posterior part of lorica slightly prolonged to form a sort of sheath for the foot ; on the dorsal side of this sheath a subsquare piece cut out, so that in dorsal view the foot orifice appears to be bounded by two or three teeth. Two posterior lateral spines long, short, or absent. (Excessively variable) . . 141, *B. bakeri* Ehr. (Fig. 103)

      f1. Posterior spines short *B. bakeri*, var. *brevispinus* Ehr.

      f2. Sheath for foot unsymmetrical (right side less developed) ; body covered with tubercles
      B. bakeri, var. *tuberculus* Turner

    e2. Two middle anterior spines longest and curving outward ; a square plate projecting from the middle of the posterior edge over the foot orifice. Usually two posterior lateral spines on the lorica, these disappearing with age
    142, *B. variabilis* Hempel

    e3. Anterior spines straight ; a deep sinus between the two median ones. No posterior spines 143, *B. urceolaris* Ehr.

      (*f1.* Reddish, spines broader
      B. rubens, a variation of *B. urceolaris*)

  d2. Lorica with but *four* teeth or spines at the anterior dorsal margin

    e1. Median anterior spines very short ; lateral ones very long. Toes large, each ending in two minute points, so that the foot at first view appears to be bifurcated

      f1. Two posterior lateral spines on the lorica, the left one very small, the right one long
      144, *B.* (or Schizocerca) *diversicornis* Daday

f2. The two posterior lateral spines equal
B. (or Schizocerca) *diversicornis*, var. *homoceros* Wierz

e2. Four variable (often subequal) anterior spines or teeth. Anterior ventral margin of lorica sinuous. Posterior part of the lorica rounded, either without teeth or with two or four teeth or spines. (Excessively variable) . 145, *B. pala* Ehr.

f1. Median anterior spines very long; no posterior spines
B. pala, var. *dorcas* Gosse

f2. Median anterior spines very long ; two marked posterior spines . . . . *B. pala*, var. *spinosus* Wierz.

e3. Four anterior spines of about equal length. Lorica subquadrate in dorsal view ; thick, so that a transverse section would be nearly a circle. A slight invagination in the sides of the lorica in the lumbar region, causing blunt angles on the sides of the lorica. Entire surface covered with minute spinules. No posterior spines
146, *B. punctatus* Hempel (Fig. 104)

d3. Anterior margin of lorica without teeth or spines ; at most merely sinuate

e1. Anterior dorsal margin sinuate, with a slight rounded notch in the middle. Lorica usually with irregular bluntly angled outlines and with faceted surface. Posterior extremity with two short blunt processes close to the foot
147, *B. angularis* Gosse

f1. The two posterior processes developed into spines
B. angularis, var. *bidens* Plate

e2. Anterior dorsal margin straight and truncated, with a small median sinus for the dorsal antenna ; lorica thin, smooth, flexible. Dorsal surface highly arched ; ventral, nearly flat. Toes pointed, and having the inner edges convex, the outer concave . . . 148, *B. mollis* Hempel (Fig. 105)

c3. Foot ending in two toes, and situated on the ventral side of the body ; lorica an irregularly oblong or ellipsoidal box, marked with grooves and sometimes with vesicles, closed behind, opened ventrally for the protrusion of the foot . . . . . . Plœsoma

d1. Lorica firm, with two wide grooves between three ridges passing transversely across the middle of the dorsal surface ; a number of deep longitudinal grooves passing forward and backward from the ends of the transverse grooves ; surface covered with fine areolations. Lorica in dorsal view about twice as long as wide, projecting at the anterior dorsal margin in a sharp median point, flanked by two small points or angles
149, *P. lenticulare* Herrick (Fig. 106)

d2. Body short, little longer than wide ; lorica with grooves and ridges much as in the last, but more thin and flexible, and not covered with areolations. Anterior dorsal margin of the lorica truncate, without points 150, *P. truncatum* Levander (Fig. 107)

d3. Lorica soft, covered with coarse areolations, partly arranged in very irregular rows; hinder part of the body retractile and extensile; when extended the body ends posteriorly in a blunt point . . . . 151, *P. molle* Kellicott

d4. Lorica soft, covered with coarse irregular cuticular vesicles; body thick, short, rounded behind
152, *P. hudsoni* Imhof (Fig. 108)

c4. Foot projecting from the ventral surface, small, lightly ringed, and ending in a single pointed toe. Lorica compressed laterally, so as to be nearly circular in side view, with a sort of projecting collar for the protrusion of the head; in dorsal or ventral view oblong. Lorica rose color; internal organs blue, green, and orange . 153, *Gastropus stylifer* Imhof (Fig. 109)

c5. Foot very small and ending in two small toes; lorica thin, compressed laterally, flask-shaped, with the foot projecting from the ventral surface; size about .10 mm.
154, *Gastropus minor* Rousselet
(See also No. 223, *Cochleare turbo*)

b2. Foot present, not transversely wrinkled nor ringed (though often jointed)

c1. Foot distinctly jointed and ending in two small toes; lorica with an arched dorsal plate and a nearly flat ventral one; dorsal surface tuberculate or faceted but not bearing spines. Spines present at the anterior and posterior margins of the lorica

d1. Lorica with ten spines in front and four behind, its whole form markedly unsymmetrical; surface faceted and covered with raised points . . . . 155, *Brachionus militaris* Ehr.

d2. Lorica flattened, only slightly arched dorsally; dorsal surface faceted and roughened: two spines in front, turned ventrally at their tips; two posterior lateral spines. *No eye*
156, *Noteus quadricornis* Ehr. (Fig. 110)

c2. Lorica flattened and bearing one or more spines on its dorsal surface (spines at the posterior margin of the lorica may or may not be present also). Foot distinct, jointed, ending in one or two toes

d1. Spines on the dorsal surface of the lorica eight or twelve (including four at the posterior margin); lorica subquadrate, rough, toothed at the edges; head covered by a chitinous shield . . . . Polychætus

e1. Eight spines on the dorsal surface of the lorica

f1. Foot bearing two large dorsal spines or spurs
157, *P. collinsii* Gosse

f2. Foot without dorsal spines . . 158, *P. serica* Thorpe *e2.* Twelve spines on the dorsal surface of the lorica; foot with two long dorsal spines

159, *P. subquadratus* Perty (Fig. 111)

d2. Two spines on the dorsal surface of the lorica, a very long one rising from the middle, a short one from near the posterior margin. Head covered with a large semicircular shield

160, *Stephanops bifurcus* Bolton

d3. One spine from the middle of the dorsal surface of the lorica; otherwise much like the last

161, *Stephanops longispinatus* Tatem (Fig. 112)

d4. One long spine from in front of the middle of the dorsal surface of the lorica; also four curved spines from the posterior margin, and a short median point at the anterior dorsal margin

162, *Brachionus* (*?*) *gleasonii* Up de Graff (Fig. 113)

c3. A broad, nearly circular projecting plate over the head, appearing like a halo. Lorica cylindrical or pyriform, covering both dorsal and ventral surfaces; not faceted nor bearing spines on the surface (though there may be spines at the posterior edge). Foot distinct; toes two

d1. Lorica pyriform, with a narrow neck, slightly prolonged behind into three subparallel acute spines. Foot with a toe-like spine above the two toes

163, *Stephanops lamellaris* Ehr. (Fig. 114)

d2. Loricá cylindric, with a distinct neck; dorsal plate prolonged behind, over the foot, as a spoon-like shield

164, *Stephanops muticus* Ehr.

c4. The very short foot ending in one, two, or more very slender, stiff, bristle-like toes; where more than one are present, these may be equal or unequal. Lorica cylindrical, fusiform, ovate, or conical, closed all around but open at each end, smooth, rather thin; frequently showing a tendency to be spirally curved or otherwise unsymmetrical in form; often with one or two longitudinal ridges. Jaws unsymmetrical. One eye

Family RATTULIDÆ

(The Rattulidæ are so badly in need of revision that it is difficult to give a usable key to the species. Moreover, it is certain that many species in addition to those hitherto recorded will be found in America.)

d1. One long, straight, bristle-like toe (if others are present, these are much shorter than the largest one) . Mastigocerca

e1. Lorica with a single marked ridge, passing from the mid-dorsal line of the lorica forward and to the right. No teeth or spines at the anterior margin of the lorica. A single long toe, with three or more minute "substyles" at its base *f1.* Body fusiform ; ridge high (one-fourth the diameter of the body) . . . . . 165, *M. carinata* Ehr. (Fig. 115)

f2. Body fusiform ; ridge low . . . 166, *M. rattus* Ehr.

f3. Body cylindrical, elongated (length about four or five times the greatest diameter), slightly enlarged in front. Ridge low, hardly noticeable. Toe about the length of the lorica . . . . 167, *M. elongata* Gosse (Fig. 116)

e2. Lorica with two parallel longitudinal ridges close together, with a groove between them. No teeth at the anterior margin of the lorica

f1. The two ridges extending three-fourths the length of the body, which is fusiform in shape ; toe very long, straight
168, *M. bicristata* Gosse (Fig. 117)

f2. The two parallel ridges close together and extending only one-half the length of the lorica ; body shorter, ovoid, or oblong in side view . 169, *M. mucosa* Stokes (Fig. 118)

e3. Lorica without a ridge, cylindrical, ovate, or conical. (See also No. 167, *M. elongata*)

f1. One or more teeth or spines present at the anterior margin of the lorica

g1. Two unequal teeth or spines at the anterior margin of the lorica ; body long-fusiform
170, *M. bicornis* Ehr. (Fig. 119)

g2. Two sharp, slender, equal spines close together at the anterior margin of the lorica ; body a cone, largest in front and tapering to a toe about one-fourth the length of the body . 171, *M. birostris* Minkiewicz (Fig. 120)

g3. A single large median tooth projecting over the head from the anterior dorsal margin of the lorica. Body cylindrical, somewhat curved ; toe little more than half as long as the body
172, *M. capucina* Wierz. & Zach. (Fig. 121)

g4. A single short broad median tooth from the anterior dorsal edge of the lorica. Body ovate-fusiform, nearly symmetrical, constricted anteriorly to form a cylindrical neck. Toe not so long as the body
173, *M. multicrinis* Kellicott (Fig. 122)

f2. Anterior dorsal margin of lorica smooth, without teeth

g1. Body very broad, ovate, compressed dorso-ventrally, unsymmetrical ; toe four-fifths the length of the body
174, *M. lata* Jennings (Fig. 123)

g2. Body short and thick, arched dorsally, nearly flat ventrally ; lateral antennæ, at the posterior lateral parts of the lorica, protected by two prominent projecting spines ; toe longer than the body
175, *M. bicuspes* Pell. (Fig. 124)

d2. Two equal bristle-like toes; these not more than half the length of the body . . . . Rattulus

e1. Lorica long-cylindrical, curved; anterior margin of the lorica with a single prominent tooth on the left side, and with a number of crenulations; toes very nearly half the length of the body, each with two substyles at the base
176, *R. tigris* Müller (Fig. 125)

e2. Body shorter, cylindrical, with two deep furrows encircling it just in front of the middle. Toes very short (less than half as long as the body is thick), and frequently retracted within the lorica, so as to be concealed
177, *R. sulcatus* Jennings (Fig. 126)

d3. Two unequal bristle-like toes, the shorter being more than half as long as the longer. (Additional short substyles may be present) . . . . Cœlopus (or Diurella?)

e1. Body short and thick (about half as thick as long); curved, with a ridge on the right side; one or two short teeth at the anterior margin of the lorica; longest toe almost or quite half the length of the body, the other little shorter; four substyles in addition to the two toes
178, *C. porcellus* Gosse (Fig. 127)

e2. Like the last, but body only about one-fourth as thick as it is long . . . . 179, *C. tenuior* Gosse

e3. No teeth at anterior margin of lorica; body curved, cylindrical or fusiform; no ridge; the two toes nearly equal, not quite so long as the body is thick
180, *C. brachyurus* Gosse (Fig. 128)

c5. Lorica cleft down the middle of the back by a fissure, whose sides are united by membrane; open at both ends for the projection of the head and foot. Toes blade-shaped
Family Salpinadæ

d1. Lorica only slightly developed, covering only the dorsal half of the body; median fissure not strongly marked (resembling the species of Furcularia, Nos. 117–121). One eye Diaschiza

e1. Minute, swiftly moving; body short, cuneiform or cylindrical; head broad; lorica covering only the posterior third of the body; median fissure broad, inconspicuous
181, *D. lacinulata* O. F. M. (Fig. 129)

e2. Larger, body laterally compressed, arched dorsally; toes equal in length to the height of the body, curved toward the dorsal side . . . 182, *D. semiaperta* Gosse (Fig. 130)

d2. Lorica well developed, an oblong box enclosing the body, open at both ends and distinctly cleft down the middle of the back; furnished with spines or teeth at the anterior or posterior margins or both; one eye . . . . Salpina

e1. Spines or teeth on the lorica as follows: two anterior dorsal, two anterior ventral, one (median) posterior dorsal, two posterior ventral. (Spines all rather short, tooth-like)
183, *S. mucronata* Ehr. (Fig. 131)

e2. Spines or teeth as follows: no anterior dorsals, two anterior ventral, one posterior dorsal, two posterior ventral. (The four following species are distinguished, all having the above characters; it is possible that they should be considered mere variations of a single species, *S. ventralis* Ehr.)

f1. Anterior ventral spines short and straight; posterior spines all short, the ventral ones recurved
184, *S. brevispina* Ehr.

f2. Anterior ventral spines very short, posterior dorsal spine short, decurved; posterior ventral pair longer than the posterior dorsal; lorica with a stippled collar
185, *S. ventralis* Ehr.

f3. Anterior ventral spines short, straight; posterior spines all long and straight, the ventral ones much the longer; lorica surface not stippled; dorsal cleft wide
186, *S. macracantha* Gosse

f4. Anterior ventral spines short, incurved; posterior dorsal conical, short, arched; posterior ventral long, stout, incurved; dorsal cleft narrow; lorica frequently stippled
187, *S. eustala* Gosse (Fig. 132)

e3. No posterior spines; anterior dorsal pair *very long;* anterior ventral pair also long and slender, but only about half as long as the dorsal ones. Lorica broad
188, *S. macrocera* Jennings (Fig. 133)

d3. Lorica as in *d2*, but without spines; the eye lacking
Diplax

e1. Body triangular in section; lateral outline of lorica nearly ovate, but strongly arched dorsally and nearly flat ventrally
189, *D. trigona* Gosse

e2. Body much compressed, long and narrow in dorsal view, in side view nearly a parallelogram. 190, *D. compressa* Gosse

c6. Foot very long, of several joints; the two toes very long; lorica entire (not cleft dorsally nor ventrally), vase-shaped or compressed, not bearing spines. Head furnished with a chitinous covering. Eye one

d1. Lorica vase-shaped, faceted, and with surface roughened; head retractile within a chitinous cap; eye one; foot bearing two spines dorsally; foot and toes together nearly or quite twice the length of the body . . . . Dinocharis

e1. A short spine dorsally between the two toes
191, *D. pocillum* Ehr. (Fig. 134)

e2. No spine between the two toes . 192, *D. tetractis* Ehr.

d2. Lorica somewhat vase-shaped, thin, smooth, and transparent; head with a thin chitinous covering; eye very close to or upon the mastax . . . . Scaridium

e1. Body nearly cylindrical or slightly compressed laterally; body, foot, and toes of about equal length
193, *S. longicaudatum* Ehr. (Fig. 135)

e2. Body broad, ovate or pear-shaped; toes about as long as body and foot together 194, *S. eudactylotum* Gosse (Fig. 136)

c7. Lorica of two dissimilar plates, one dorsal and one ventral, the former usually larger and arched (except in No. 201), the latter flat or slightly convex. Large transparent rotifers, with a single eye. Foot jointed, the two toes large, usually blade-shaped
Euchlanis

d1. Lorica oval or ovate, gently arched above, nearly flat below; transverse section a low segment of a circle

e1. Ventral plate with a flange projecting laterally from its junction with the body; anterior dorsal edge with a broad gap having a straight bottom (Fig. 138); hind dorsal edge notched . . . . 195, *E. dilatata* Ehr. (Fig. 137)

e2. Ventral plate without a lateral flange; anterior dorsal margin with a small subsquare notch 196, *E. deflexa* Gosse

d2. Lorica a long, narrow oval or an ellipse, depressed; anterior dorsal edge membranous; transverse section a low circular segment; ventral plate elliptical and broadest at the hind end
197, *E. lyra* Hudson

d3. Lorica broadly oval or ovoid, constricted near the middle, the dorsal plate much wider than the ventral and turned downward and inward . 198, *E. pyriformis* Gosse (Fig. 139)

d4. Lorica roof-shaped, with sloping sides; not rising to a ridge; cleft for a short distance behind. Ventral plate flat, smaller in outline than the dorsal. A small species, 199, *E. oropha* Gosse

d5. Lorica with a high median dorsal keel; lateral edges of the lorica extending laterally into two wide shelves, so that the animal seems to have three keels, and is triangular in section. Outline from above ovoid . . . . 200, *E. triquetra* Ehr.

d6. Dorsal plate carinate; lorica ovate, flask-shaped; foot four-jointed; toes more than half the length of the lorica
201, *E. ampuliformis* Herrick (*E. propatula*) Gosse (?) (Fig. 140)

c8. Lorica of two plates, the ventral one nearly flat, the dorsal one slightly or considerably elevated. The two plates separated by a deep lateral furrow covered with flexible membrane. Body ending posteriorly in either one or two large rod-shaped toes (the foot proper being short and inconspicuous). One eye
Family CATHYPNADÆ

d1. Toes two

e1. Lorica subcircular or broadly ovoid, with a wide and deep lateral furrow . . . . Cathypna

f1. Lorica rather flattened, dorsal and ventral plates nearly equal in size, broadly oval in outline ; toes two-fifths as long as the lorica, each with a distinct angle or shoulder at the side, near the tip, and with a small sharp claw, which continues the inner side of the toe 202, *C. luna* Ehr. (Fig. 141)

f2. Lorica ovoid, the dorsal plate ending behind in a subsquare plate with its posterior lateral corners extended into distinct angles. Toes rod-shaped, very long (almost as long as the lorica) . . 203, *C. leontina* Turner (Fig. 142)

f3. Very large (.31 mm. in length) ; lorica long ovoid or truncate elliptical in form ; dorsal plate projecting posteriorly as a semicircular plate over the foot. Toes about half the length of the lorica . . 204, *C. ungulata* Gosse

e2. Lorica longer, usually a long ellipse, open in front ; lateral furrow not pronounced . . . . Distyla

f1. Dorsal plate faceted, *i.e.*, marked off into polygonal areas

g1. Dorsal plate ending behind in a quadrangular projection with nearly parallel sides

205, *D. ohioensis* Herrick (Fig. 143)

g2. Dorsal plate ending behind in two sharp points separated by a broad gap . 206, *D. stokesii* Pell (Fig. 144)

g3. Dorsal plate ending behind in a single sharp point

207, *D. ludwigii* Eckstein (Fig. 145)

g4. Dorsal plate not ending behind in projections, but bearing in the posterior lateral region two short projecting teeth, protecting two lateral antennæ. Foot conspicuous, three-jointed 208, *D. spinifera* Western (Fig. 146)

f2. Dorsal and ventral plates marked with small crescentic elevations arranged in somewhat regular patterns. Lorica of truncate elliptical form, without posterior projections

209, *D. signifera* Jennings (Fig. 147)

f3. Lorica flexible, smooth, or marked with irregular wrinkles or longitudinal folds

g1. Small, lorica parallel-sided, soft, with irregular wrinkles and longitudinal folds . . 210, *D. flexilis* Gosse

g2. Lorica long, flexible, nearly parallel-sided when extended (Fig. 148) ; when completely retracted broader in front and ending in two strong incurved points (Fig. 149). Dorsal surface with a few irregular longitudinal folds . 211, *D. gissensis* Eckstein (Figs. 148 and 149) *g3*. Lorica soft, much broader behind and tapering forward to the narrow head when extended ; broad ovate, truncate, when retracted. Toes short, with claw about one-third the length of the toe . 212, *D. inermis* Gosse

d2. One rod-shaped toe . . . . Monostyla

e1. Lorica broad ovate, flat, projecting anteriorly into two long sharp, outwardly curved spines, separated by a narrow rounded notch . . . . . 213, *M. quadridentata* Ehr. (Fig. 150)

e2. Lorica ovate, toe broadly fusiform
214, *M. closterocerca* Schmarda (Fig. 151)

e3. Lorica without spines ; toe rod-shaped or tapering to the tip

f1. Lorica broadly ovate, with a crescentic concavity in front when the head is retracted. Toe with parallel sides
215, *M. lunaris* Ehr. (Fig. 152)

f2. Lorica ovate, without a crescentic concavity in front when the head is retracted, but nearly truncate. Toe short, rod-like . . . . 216, *M. cornuta* Ehr. (Fig. 153)

f3. Dorsal plate high arched, ventral somewhat convex ; anterior dorsal edge of lorica with a shallow, rounded or quadrate notch ; ventral plate with a much deeper, broader notch . . . . 217, *M. bulla* Gosse (Fig. 154)

f4. Lorica ovate ; two anterior lateral points when the head is retracted. Ventral plate flexible, with irregular longitudinal folds . . . . 218, *M. arcuata* Bryce (Fig. 155)

f5. Lorica subcircular, but little longer than broad ; two inwardly curved sharp points at the anterior edge when the head is retracted ; toe rod-like, ending in two short claws projecting from between two minute spines
219, *M. robusta* Stokes (Fig. 156)

f6. Lorica subovate, with a straight anterior margin when contracted (insufficiently described)
220, *M. truncata* Turner

f7. Lorica broadly ovate, truncate, rounded dorsally. Dorsal plate strengthened by two diverging longitudinal ribs about equidistant from each other and from the lateral edges of the plate, rendering the anterior margin slightly angulate where they join it . . . 221, *M. ovata* Forbes

e4. Lorica a soft, flexible, corrugated skin, hardly deserving the name of lorica. Body oblong, subcylindric. Toe rod-shaped, with a short claw . . . . 222, *M. mollis* Gosse

c9. Lorica of a single piece, like a coat, covering only the anterior half of the dorsal surface of the body, or less ; foot long, jointed, with two minute toes . . . . Cochleare

d1. Lorica three-sided . . . 223, *C. turbo* Gosse (Fig. 157) *c10*. Head surmounted by an arched chitinous shield, appearing in side view like a hook; lorica either arched, and compressed laterally, or dorso-ventrally flattened

d1. Lorica arched, somewhat compressed laterally, so as to be higher than wide; open behind and in front, and sometimes open on the ventral side. Minute, inconspicuous rotifers
Colurus

e1. Lorica ovate as viewed from above; produced caudally (as seen in dorsal view) into two acute spines, separated by a deep sinus; ventral surface of lorica cleft
224, *C. deflexus* Ehr. (Fig. 158)

e2. Lorica not cleft ventrally; excavate behind, so as to form two teeth with a shallow notch between them
225, *C. bicuspidatus* Ehr. (Fig. 159)

e3. Pear-shaped, widest behind, in dorsal view; ventral surface cleft; caudal notch very shallow, between two short terminal points; foot and toes three-fourths the length of the lorica . . . . 226, *C. caudatus* Ehr.

e4. Ovate in dorsal or lateral view, the posterior end rounded, without points; lorica cleft ventrally. Foot very small
227, *C. obtusus* Gosse (Fig. 160)

e5. Elongate-ovate in dorsal view; caudal margin rounded, without cleft or points; ventral cleft interrupted in front of the middle, so that the openings for the head and foot are not continuous . . . . 228, *C. agilis* Stokes (Fig. 161)

e6. Lorica ovate in dorsal view, high behind, low in front; a long, stiff, pointed, hyaline crest extending backward and upward from the middle of the anterior dorsal edge of the lorica . . . . . 229, *C. cristatus* Rousselet (Fig. 162)

d2. Height and width of lorica about the same; lorica forming an ovate box with surface marked into areas; a thin ridge on the mid-dorsal line; a similar ridge on the mid-ventral line from the anterior margin to about the middle of the length
230, *Metopidia salpina* Ehr. (Fig. 163)

d3. Lorica flattened, wider than high, usually turtle-like in appearance; open only in front and behind, not along the ventral middle line . . . . Metopidia

e1. Outline of lorica varying from elliptical through oval and ovate to orbicular, but without teeth, spines, or prominent angles (except at the sides of the foot and head, where angles are necessarily formed, owing to the openings in the lorica)

f1. Lorica nearly circular, much depressed; dorsal plate with a very low rounded median ridge and with a submarginal line of corrugation . . . . 231, *M. solidus* Gosse

f2. Lorica oval or ovate, much depressed, evenly rounded above ; ventral plate excavate behind for the foot ; eyes two . . . . 232, *M. lepadella* Ehr. (Fig. 164)

f3. Similar to the last, but with four eyes. (Perhaps only a variation of the last) . . . . . 233, *M. bractea* Ehr.

f4. Lorica elliptical or ovately oblong ; toes long, slender ; eyes two or four ; foot of three nearly equal joints
234, *M. oblonga* Ehr. (Fig. 165)

f5. Like the last (of which it is probably only a variation), but with the third joint of the foot equal in length to the other two together ; the two toes protruded between two minute lateral spines . 235, *M. dentata* Turner (Fig. 166)

f6. As in *M. oblonga*, but with the anterior margin of the lorica covered with points, so as to form a stippled collar ; the angles of the lorica at the sides of the head very sharp, so as almost to form spines (variation of *M. oblonga ?*)
236, *M. collaris* Stokes (Fig. 167)

e2. Lorica rhomboid-ovate in outline ; dorsal plate roof-shaped, lower behind and ending in an obtuse point ; ventral surface flat . . . . 237, *M. rhomboides* Gosse

e3. Lorica ovate, ending behind in an acute point
238, *M. acuminata* Ehr.

e4. Lorica with three wide, thin wings, one dorsal and two lateral ; the dorsal view nearly circular
239, *M. triptera* Ehr.

e5. Lorica broad behind, having four prominent angles, two lateral and two posterior
240, *M. ehrenbergii* Perty (Fig. 168)

e6. Lorica with two great spines at the anterior dorsal margin ; these separated by a narrow median notch
241, *M. cornuta* Schmarda (Fig. 169)

Ann Arbor, Mich., Feb. 5, 1901.

SOME OF THE MORE IMPORTANT LITERATURE ON THE ROTATORIA.

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1. Floscularia pelagica, after Rousselet.
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3. “ trilobata, after Hudson and Gosse.
4. “ cornuta, after Weber.
5. “ coronetta, after Weber.
6. “ ornata, after Weber.
7. “ campanulata, after Weber.
8. “ algicola, after Hudson and Gosse.
9. Stephanoceros eichhornii, after Weber.
10. “ “ , jaws, after Hudson and Gosse.
11. Acyclus inquietus, after Leidy, from Hudson and Gosse.
12. Apsilus bipera, ventral view of head, after Foulke, from Stokes.
13. “ bucinedax, after Stokes.
14. Melicerta ringens, in tube, after Hudson and Gosse.

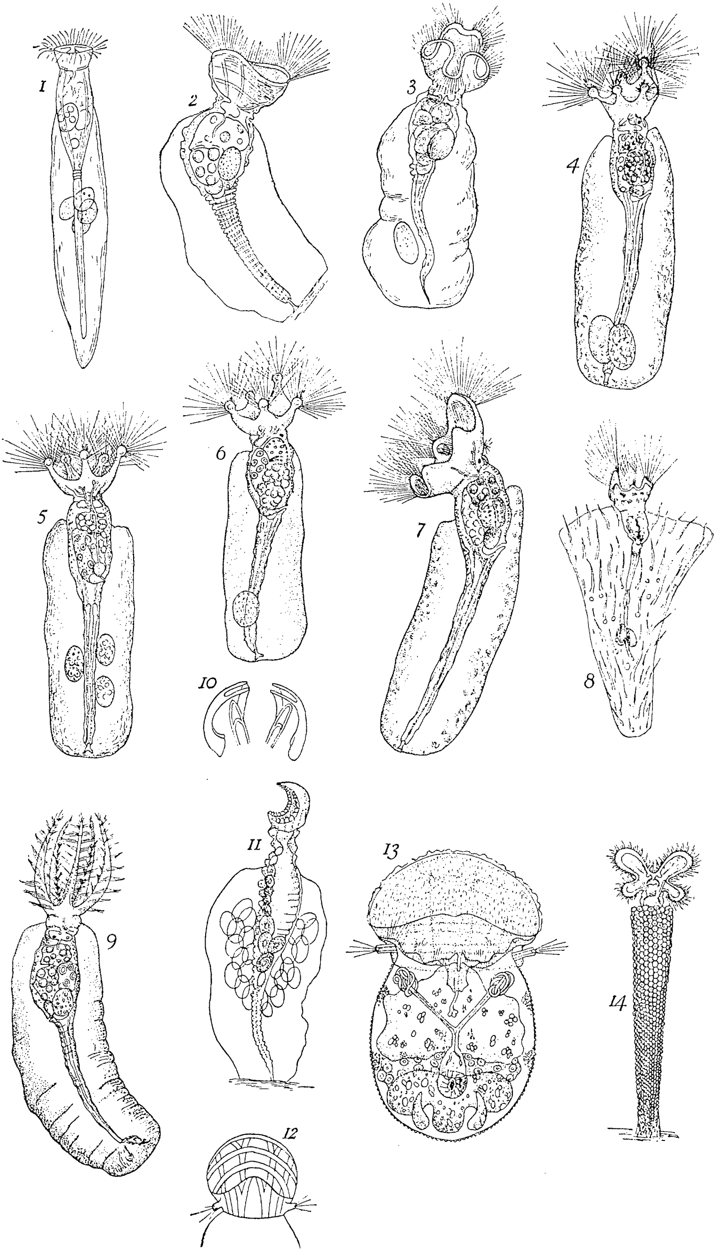

PLATE I.

LIST OF FIGURES — PLATE II.

15. Melicerta ringens, removed from tube, after Weber.
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20. Cephalosiphon limnias, after Weber.
21. Œcistes melicerta, side view.
22. " crystallinus, after Hudson and Gosse.
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26. Conochilus volvox, after Hudson and Gosse.
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28. Rotifer macroceros, after Weber.
29. " neptunius, after Weber.
30. " vulgaris (corona retracted), after Weber.
31. Foot of Rotifer trisecatus, after Weber.
32. " " " elongatus, after Weber.
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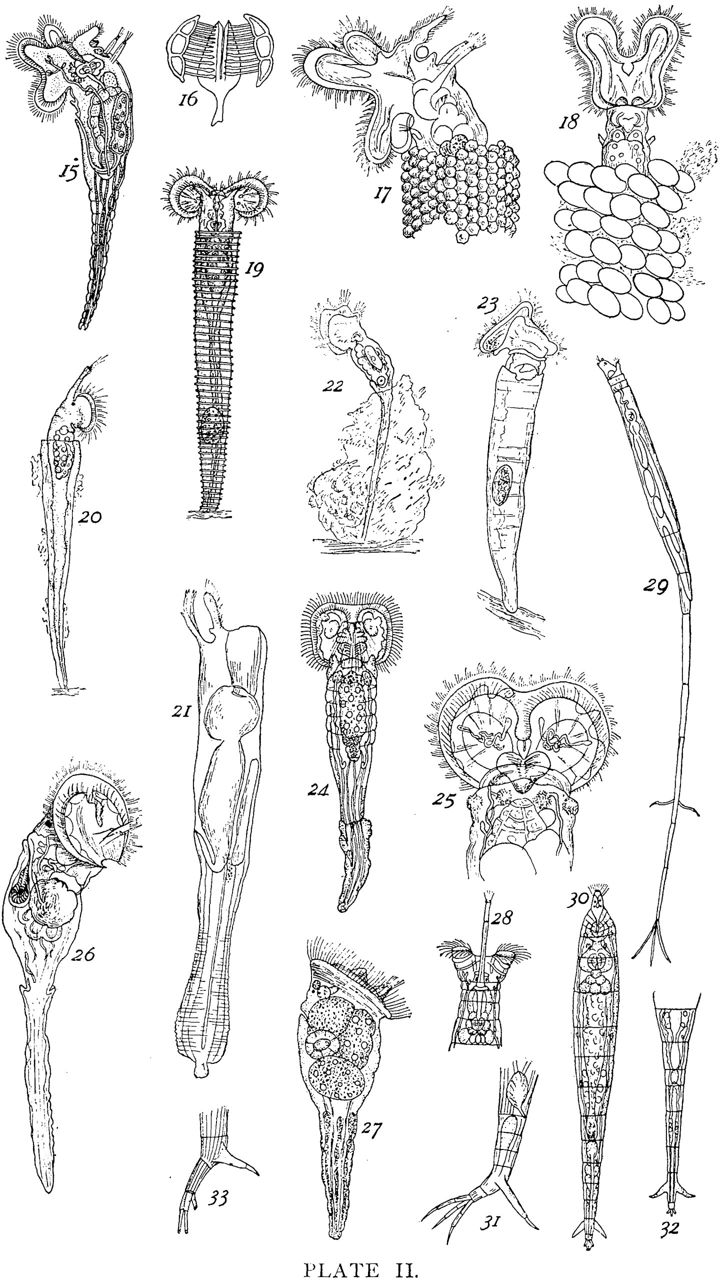

PLATE II.

LIST OF FIGURES — PLATE III.

34. Jaws of Philodina aculeata (ramate type), after Weber.
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45. Microcodon clavus, after Weber.
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56. Ascomorpha hyalina, after Kellicott.
57. " ecaudis, after Hudson and Gosse.

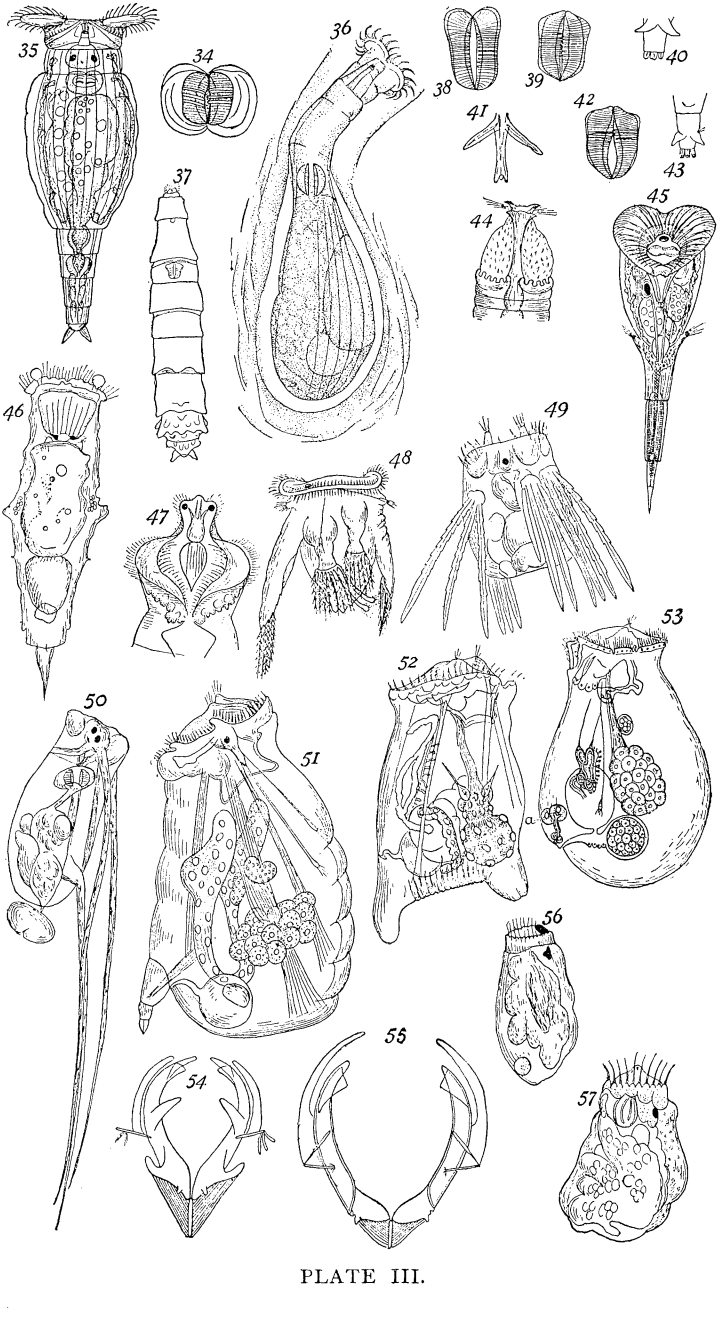

PLATE III.

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68. " selenura, toes, after Hudson and Gosse.
69. Copeus copeus, after Ehrenberg.
70. " pachyurus, after Weber.
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76. " collaris, after Ehrenberg.
77. " aurita, after Hudson and Gosse.

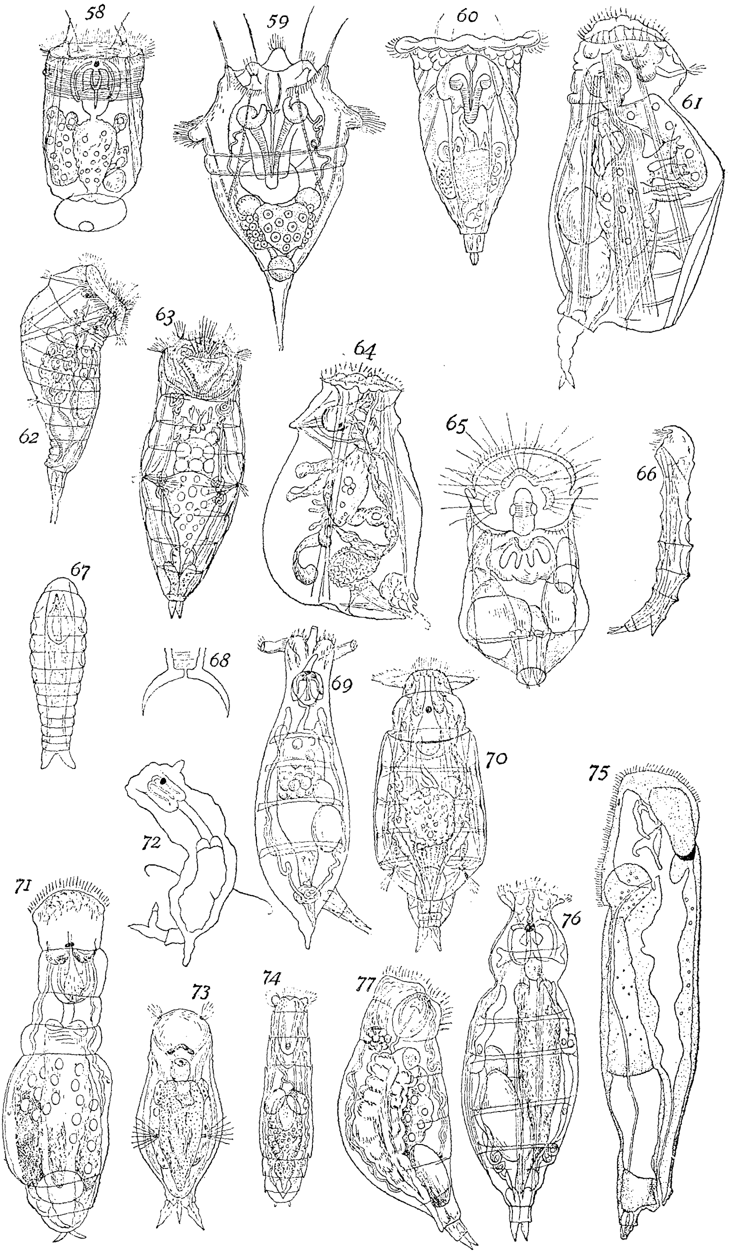

PLATE IV.

LIST OF FIGURES — PLATE V.

78. Notommata cyrtopus, after Hudson and Gosse.
79. “ torulosa, after Cohn, from Hudson and Gosse.
80. Proales felis, after Hudson and Gosse.
81. “ sordida, after Hudson and Gosse.
82. “ micropus, after Hudson and Gosse.
83. “ decipiens, after Weber.
84. “ gibba, after Ehrenberg.
85. Furcularia forficula, after Weber.
86. “ gracilis, after Hudson and Gosse.
87. “ gibba, after Ehrenberg.
88. Triophthalmus dorsualis, after Ehrenberg.
89. Eosphora aurita, after Ehrenberg.
90. Diglena grandis, after Hudson and Gosse.
91. “ forcipata, after Ehrenberg.
92. “ circinator, after Hudson and Gosse.
93. “ caudata, after Hudson and Gosse.
94. “ catellina, after Weber.
95. “ biraphis, after Hudson and Gosse.
96. Anapus ovalis.
97. Anuræa hypelasma, after Hudson and Gosse.
98. “ cochlearis, after Weber.
99. “ aculeata, after Hudson and Gosse.
100. Notholca longispina, lorica, after Hudson and Gosse.
101. Pterodina patina, after Hudson and Gosse.
102. “ reflexa, after Rousselet.

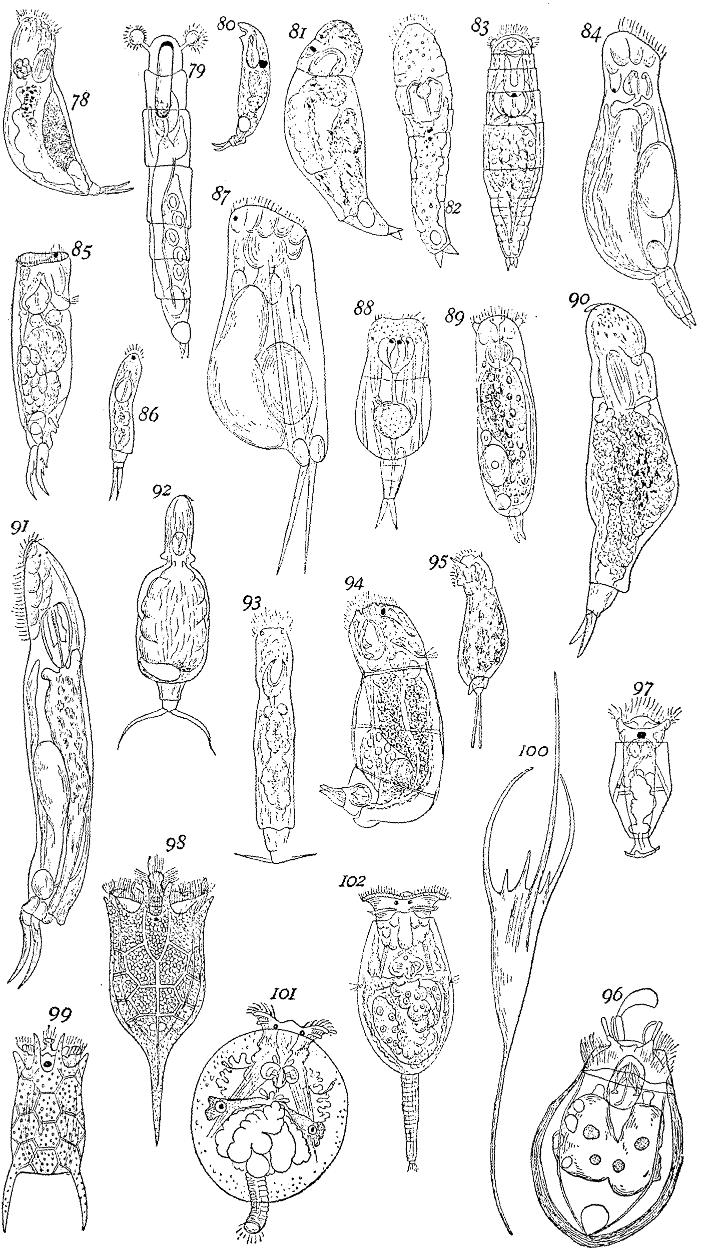
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PLATE V.

LIST OF FIGURES — PLATE VI.

103. Brachionus bakeri.
104. " punctatus, after Hempel.
105. " mollis, after Hempel.
106. Pleosoma lenticulare, after Wierzejski.
107. " truncatum, after Weber.
108. " hudsoni, after Wierzejski.
109. Gastropus stylifer, after Weber.
110. Noteus quadricornis, after Hudson and Gosse
111. Polychætus subquadratus.
112. Stephanops longispinatus, after Weber.
113. Brachionus (?) gleasonii, after Vorce, from Hudson and Gosse.
114. Stephanops lamellaris, after Weber.
115. Mastigocerca carinata.
116. " elongata.
117. " bicristata.
118. " mucosa.
119. " bicornis.
120. " birostris, after Minkiewicz.

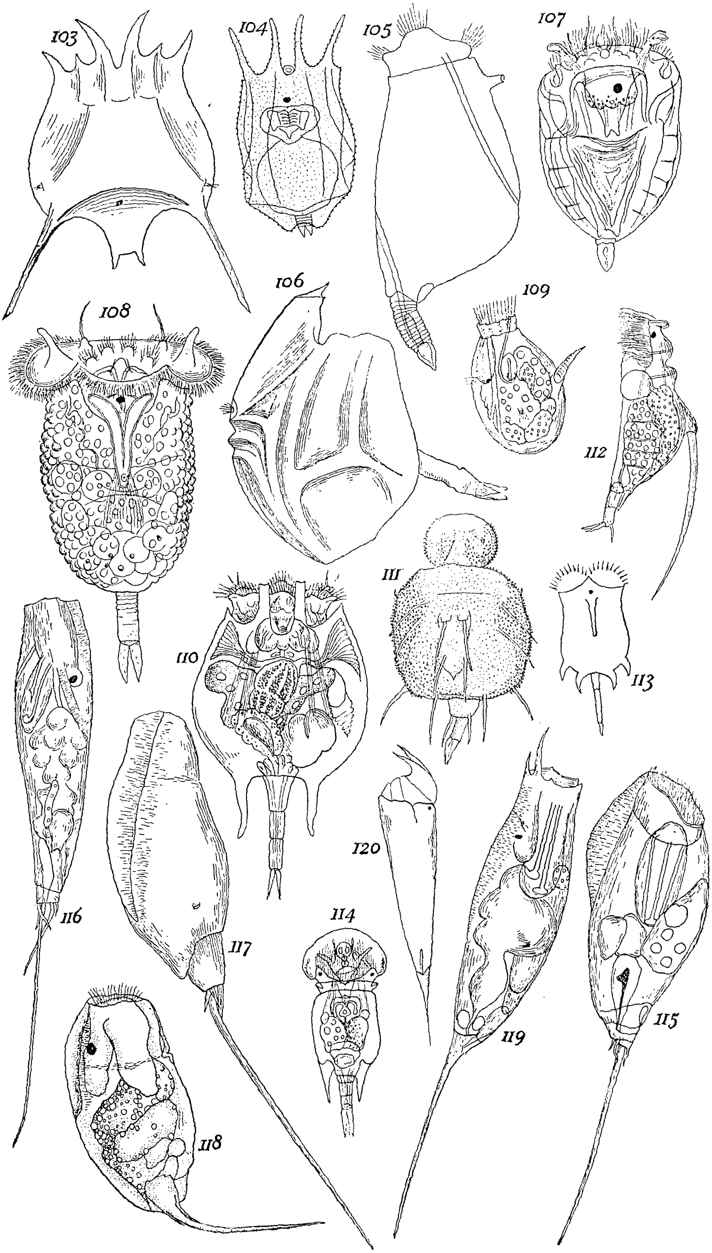
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PLATE VI.

LIST OF FIGURES — PLATE VII.

121. Mastigocerca capucina, after Wierzejski.
122. " multicrinis, after Kellicott.
123. " lata.
124. " bicuspes.
125. Rattulus tigris.
126. " sulcatus.
127. Coelopus (?) porcellus.
128. " brachyurus.
129. Diaschiza lacinulata, after Weber.
130. " semiaperta, after Hudson and Gosse.
131. Salpina mucronata, after Hudson and Gosse.
132. " eustala, after Hudson and Gosse.
133. " macrocera.
134. Dinocharis pocillum, after Hudson and Gosse.
135. Scaridium longicaudatum, after Weber.
136. " eudactylotum, after Hudson and Gosse.

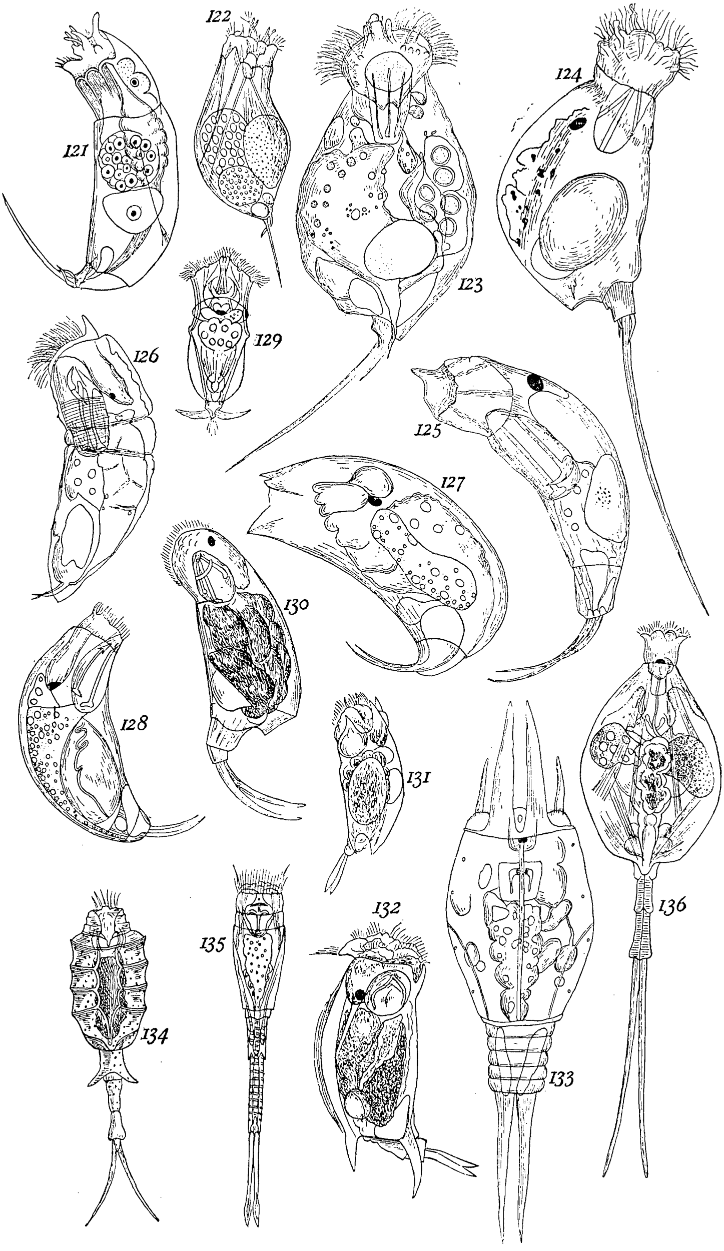


PLATE VII.

LIST OF FIGURES — PLATE VIII.

137. Euchlanis dilatata, after Hudson and Gosse.
138. " " , anterior dorsal edge of lorica, after Hudson and Gosse.
139. " pyriformis, after Hudson and Gosse.
140. " ampuliformis, after Herrick.
141. Cathypna luna.
142. " leontina.
143. Distyla ohioensis.
144. " stokesii.
145. " ludwigii.
146. " spinifera, after Western.
147. " signifera.
148. " gissensis, partly extended.
149. " " , retracted.
150. Monostyla quadridentata.
151. " closterocerca.
152. " lunaris.

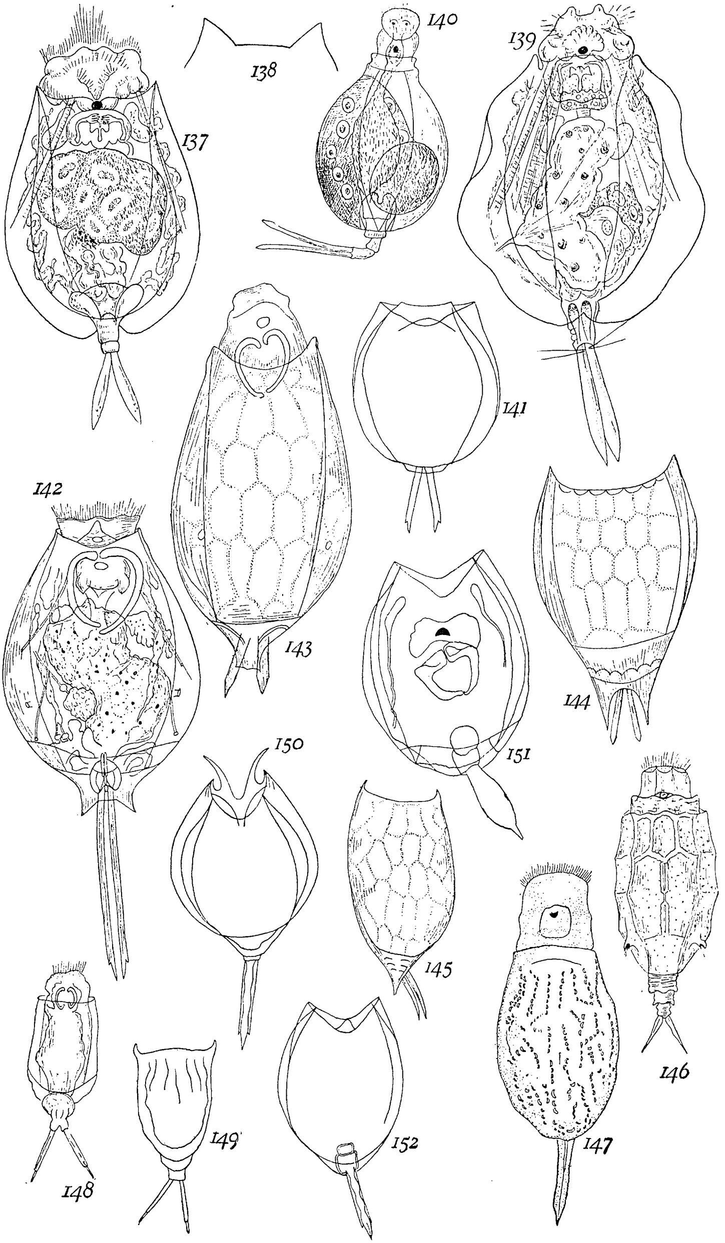
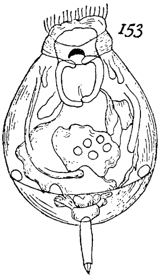


PLATE VIII.

LIST OF FIGURES — PLATE IX.

153. Monostyla cornuta.
154. " bulla.
155. " arcuata.
156. " robusta, after Stokes.
157. Cochleare turbo, after Hudson and Gosse.
158. Colurus deflexus, after Hudson and Gosse.
159. " bicuspidatus, after Hudson and Gosse.
160. " obtusus, after Hudson and Gosse.
161. " agilis, ventral view of lorica, after Stokes.
162. " cristatus, after Rousselet.
163. Metopidia salpina, after Weber.
164. " lepadella, after Ehrenberg.
165. " oblonga, after Ehrenberg.
166. " dentata, after Turner.
167. " collaris, after Stokes.
168. " ehrenbergii.
169. " (?) cornuta, after Schmarda.
170. Malleate jaws, after Hudson and Gosse.
171. Forcipate jaws, after Hudson and Gosse.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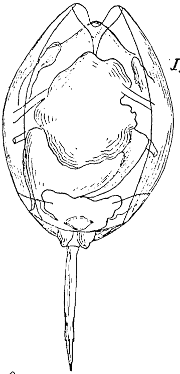
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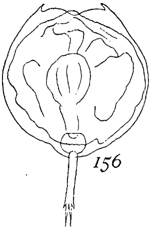
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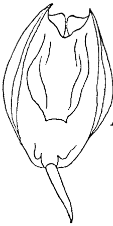
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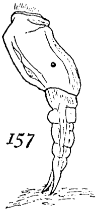
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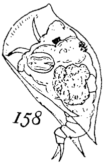
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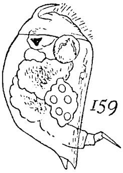
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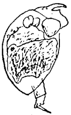
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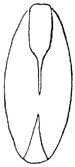
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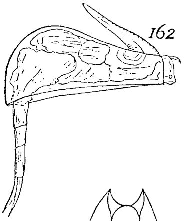
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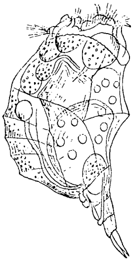
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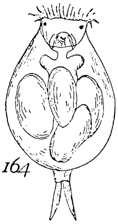
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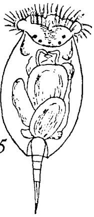
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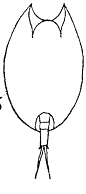
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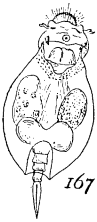
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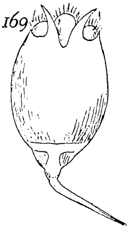
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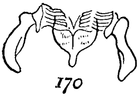
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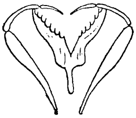
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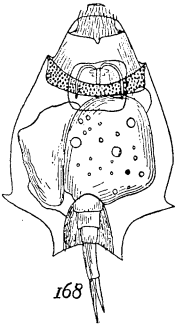
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PLATE IX.